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THE

WORKS

OF THE HONOURABLE

ROBERT BOYLE.

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VOLUME V.

GX

LONDON:

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TO

DR. *RICHARD MEAD*,

Phyſician in Ordinary to HIS MAJESTY,

THIS

FIFTH VOLUME

OF THE

WORKS

OF

The Honourable *ROBERT BOYLE*

Is humbly dedicated,

By his moſt devoted and

Moſt obedient Servant,

Andrew Millar.

MEDICINA HYDROSTATICA:

OR,

HYDROSTATICKS

Applied to the

MATERIA MEDICA.

SHEWING,

How by the weight, that divers bodies uſed in phyſick have in water, one may diſcover, whether they be genuine or adulterate.

To which is ſubjoined,

A previous hydroſtatical way of eſtimating ORES.

The PREFACE.

I AM far from being fond of their practice, that affect to give pompous and promiſing titles to their books; inſomuch that my friends have ſeveral times reproached me with inclining too much to the oppoſite extreme. But yet I am not averſe from prefixing to the enſuing paper the title of *Medicina Hydroſtatica*; not only for the conveniency of citations, (which are uſually troubleſom to make in tracts that have long titles;) but becauſe too I am invited, if not authoriſed to do it, by the example of the famous and judicious Sanctorius, who ſcrupled not to prefix the name of *Medicina Statica* to a writing almoſt as ſmall, as it is ingenious, which applies the balance to ſome uſes relating to the medicinal art, perhaps not more than will be here found propoſed of the ſame inſtrument, improved by ſome additions. And it is ſcarce to be doubted, but that in this inquiſitive age, the ſagacity of the curious will make, both of what he has diſcovered, and of what I have delivered, uſeful applications, that neither he, nor I, ever thought of.

IF the chief thing I aimed at in writing, had been to gain applauſe, I would have taken a more likely way to obtain it, than by treating of a ſubject, wherein few will think themſelves concerned, (though many in reality be ſo,) and whoſe importance does not at firſt view appear. And this ſubject too the nature of it has obliged me to treat of in ſuch a way, that it will be almoſt as unpleaſant to the reader to peruſe ſo unadorned a piece, as it was troubleſom to the author to write ſo toilſom an one. And indeed, when I came to take notice of the number of particulars, that I had brought together into this little book; I did myſelf ſomewhat wonder, how I came to be prevailed with to lay out ſo much pains upon ſo uninviting a ſubject. But knowledge and health are two ſuch valuable things, that I durſt not refuſe to undergo, even a toilſom taſk; whilſt I was encouraged by the hope, that was given me, that this kind of labour may conduce ſomewhat to thoſe deſirable ends; if not otherways, yet at leaſt by exciting the more curious among phyſicians, chemiſts, and others, to enlarge their inquiries; and by helping them to remark divers things relating to medicinal bodies, that they are wont to overlook.

I HAD probably better conſulted my reputation, as well as my eaſe, if, having contented myſelf with thoſe few uncommon notions, that the reſt of the book was built upon, I had left the application made of them to particular bodies, to the induſtry of others. I ſhall not ſolicitouſly excuſe myſelf, for not having beſtowed more ornaments upon the following eſſay; ſince the nature of the ſubject, and drift of the writer, are ſufficient to juſtify the plainneſs of my ſtile to the judicious. I may have ſomewhat more cauſe to apologize for this, that I have not caſt a treatiſe about a ſubject, wherein mechanicks are ſo much employed, into the form of propoſitions, and given it a more mathematical

dreſs. But I was unwilling by that means to diſcourage thoſe many, who, when they meet with a book, or writing, wherein the titles of theorem, problem, and other terms of art, are conſpicuouſly placed, uſe to be frighted at them; and thinking them to be written only for mathematical readers, deſpair of underſtanding it; and therefore lay it aſide, as not meant for the uſe of ſuch as they.

BUT there is another thing, upon whoſe ſcore, I confeſs, I ought to wiſh for indulgent readers. For the papers compiled into this eſſay having been written in looſe ſheets, and at ſuch diſtinct times, that divers accidents intervened between them; the loſs of ſome of thoſe papers, as well as others of different natures, and my want of health, and leiſure, obliged me to change more than once my propoſed deſign, and to employ ſometimes the ſtile of a private letter, and ſometimes again that of a diſcourſe intended for the publick; by which means ſome things, and ſome expreſſions, that were ſuitable to the deſign I had, when I committed them to paper, became incongruous, when the ſcope and ſcheme of my diſcourſe were altered; eſpecially ſome parts of the copy being out of my hands, when I ſhould have adjuſted the others to them. But though theſe irregularities may keep the parts of this eſſay from being ſo coherent as they ſhould be, yet they will not prove very prejudicial to an intelligent reader, who, finding the matters of fact, and the notions to be true, may, notwithſtanding the want of an uniform contexture, make good uſe of them.

THOUGH divers little memoirs and other things, that occurred to me from time to time, whilſt I was bringing together the following papers, have inſenſibly ſwelled them into a book; yet the eſſay itſelf was in my firſt intention but a large fragment of a greater work: whereof an account is given in the letter to a friend, (that is premiſed to a paper annexed to the following eſſay) which (letter) having been intended for a kind of preface to the laſt ſcheme of the whole larger ſcheme, if the reader pleaſe to peruſe it, he will there find the riſe and ſcope of this little tract, as well as of the other parts of that deſigned book; and ſome other things, that may make it needleſs to lengthen this preamble by any thing more than two advertiſements. Of theſe, one is, that being reduced by divers unexpected and unwelcome accidents, to forego my firſt deſign, and give only two or three ſpecimens of what was intended, and more than begun; I made choice of the title of the chemical changes of bodies by coloration, as a ſample of the chemical part of the treatiſe; and I pitched upon the ſubject of this preſent eſſay, as a ſpecimen of the mechanical part of the ſame treatiſe: the other advertiſement is, that the reader may not be ſtartled, to find ſome little variations of ſpecifick gravity among ſome of the memoirs laid together in this eſſay, becauſe he will in due place be told, why ſuch things ought to be expected. And in the mean time, it may, I hope, ſuffice to ſay, that ſuch variations are neither new, nor eaſily avoidable things, in making hydroſtatical experiments, or others of affinity to them. For proof of which, to readers, that for want of having made trials themſelves, may diſtruſt what we have ſaid, I ſhall produce a couple of notable teſtimonies. The firſt is given by ſo induſtrious and diligent a mathematician, as *Merſennus** himſelf. For he candidly acknowledges, when he has occaſion to mention ſome trials of the learned *Ghetaldus*, and of the accurate French engineer monſieur *Petit*, and of his own, that the variety of weighing, which often happens to amount to ſome grains, is but like the variety of aſtronomical obſervations, which do almoſt always differ in ſome minutes or ſeconds. To which he ſoon after adds an intimation, that ſhews, that he expected not an exact uniformity between the obſervations of *Ghetaldus*, &c. already made, and the trials of an experimenter, that would examine them by making the like again. See the chapters.

To this firſt teſtimony we ſhall ſubjoin the ſecond; which is, that our famous experimenter, the lord *Verulam* himſelf, writing of a ſubject, that in ſeveral things has much affinity to ours, confeſſes, that it is not to be doubted, but that many of the bodies, which † he has ſet down in his table of their dimenſions and weights, differ in the ſame ſpecies or denomination, ſome being heavier than others; and that therefore there is ſome contingency in this affair, ſo that it is not neceſſary, that the individuals he made his trials with ſhould be exact ſtandards of the nature of their reſpective ſpecies, or ſhould (which makes directly to my preſent purpoſe) agree altogether to a tittle with experiments of other men.

BUT this ſcarce evitable imperfection of hydroſtatical and the like experiments does not hinder, but that by their help we may make good eſtimates of the weights, and bulks, of very many bodies; and among them of not a few, that belong to two ſorts of the three, that our illuſtrious author acknowledges to be reducible to his way of menſuration. And theſe eſtimates will (if I miſtake not) be found, not only preferable to thoſe, that can be of the ſame bodies by geometrical inſtruments, but (which is more conſiderable for the reader) accurate enough to be very uſeful on a great number and variety of occaſions. Which laſt clauſe I purpoſely add to inſinuate, that the hydroſtatical way of menſuration may be uſefully applied to ſeveral bodies and caſes, that do not at all ſeem to relate to the Materia Medica; as would appear by inſerting here what is delivered about metrical and about exploratory obſervations in other papers; if that were not too foreign to the enſuing eſſay, as not belonging to the ſubject, or to the deſign of it.

* *Varietas ponderandi, quæ ſæpius in quibuſdam granis contingit, ſimilis eſt varietati aſtronomicarum obſervationum, quæ ſemper ferè quibuſdem minutis, ſive primis, ſive ſecundis differunt.* Merſennus in Phænomenis Hydraulicis.

† *Hiſt. denſit. & rarit. P. M.* 12. *Editionis Londinen. in Octavo.*

MEDICINA HYDROSTATICA:

AN

ESSAY.

CHAP. I.

I HAVE, in a former tract, endeavoured (and, as I am told in print and otherwiſe, not altogether unſucceſsfully) to make it probable, that divers, if not moſt of the real virtues (for many fabulous ones have been aſcribed to them) of gems or precious ſtones may in great part proceed from the qualities of metalline and mineral ſubſtances, that, whilſt the matter was either fluid or ſoft, were (more or leſs plentifully) incorporated with the ſtony matter, which hardned afterwards into a gem. The ſame phænomena and reflections, that led me to the opinion newly recited, induced me to think it alſo very probable, that divers boles, clays, and other earths, and much more that ſeveral minerals, which, though not looked upon as metalline ores, and ſeveral ſtones or ſtony ſubſtances, that, by reaſon of their bigneſs or opacity, or perhaps unpleaſant colours, have been judged unworthy to be numbered among gems or precious ſtones, may yet be endowed with conſiderable medical virtues; and perhaps with greater than the finer gems themſelves, becauſe in theſe deſpiſed ſtones and minerals there is often found a greater ſtore of metallick and mineral parts, which, while they were in *ſolutis principiis*, as chemiſts ſpeak, might with eaſe plentifully inſinuate themſelves into theſe more open bodies, where being ſettled, they were not locked up ſo faſt and ſtrongly, as in the nobler gems; ſuch as diamonds, rubies, ſapphires, *&c.* which are of ſo compact, and as it were glaſs-like a nature, that divers corroſive liquors, and aqua fortis it ſelf, are unable to penetrate and diſſolve them; though, as hereafter will appear, theſe inferior medical ſtones, and other minerals, may be opened by the like menſtruums.

UPON theſe grounds, I thought it might be a thing of uſe to phyſicians, as well as to divers mineraliſts and mine-workers, if I imparted to them a way of exploring many foſſils, that I do not remember I had met with, either among phyſicians or chemiſts: and though this way of exploration pretends not to diſcover directly more than one quality of the body examined by it; yet that quality, being its ſpecifick gravity, is ſo radical and conſiderable a one, that it may lead a ſagacious enquirer further than at firſt ſight one would think.

I CONSIDERED then, that the moſt pure and homogeneous kind of ſtones that we know of, and that ſeems the freeſt from all adventitious mixtures, and even * TR's, is rock-cryſtal: and therefore I pitched upon this, as the ſtandard I would employ, to make eſtimates of the greater or leſſer receſs from ſimplicity or homogeneity of the ſtones, or other ſtone-like ſubſtances, whoſe ſpecifick gravity I ſhould examine.

* Tinctures.

WE took then ſome pieces of native cryſtal, clear and colourleſs; and having carefully weighed them, firſt in the air, and then in water, we found, by computation, that pure cryſtal was to clear water of the ſame bulk as two and an half, or thereabouts, are to one: ſo that, to clear the matter by an inſtance, if we ſuppoſe an hollow cube, of braſs or other metal, to be filled as carefully as may be (for the upper ſurface will ſcarce be exactly level) with ℥j. of water, and if afterwards the cavity of the emptied veſſel be exactly filled with a cubical piece of rock-cryſtal, this ſtone will weigh ℥ij and about an half. Some of my trials, indeed, made with tender balances, repreſented the proportion of theſe two bodies with ſome petty variation. But beſides, that it is not improbable, that differing pieces of rock-cryſtal itſelf, though of equal bulk, may not be preciſely equal in ponderoſity; beſides this, I ſay, the variation I found from the newly aſſigned proportion was ſo ſmall, that having juſt intimated, that for the moſt part it rather favoured a little the ſpecifick gravity of the cryſtal, than fell ſhort of it; we may neglect it without any prejudice, worth taking notice of, to the uſe that is to be made of this proportion in this paper. And for as much as there may be ſome ſcruple, though groundleſs, made about the origin and nature of cryſtal; I ſhall add, by way of confirmation of what has been delivered, that I procured ſome ſtrong icicles, that had been faſtened to vaults, *&c.* as bodies that would be acknowledged to be true ſtones, and yet to have been in a liquid form; and having hydroſtatically examined theſe concretions, the ſpecifick gravity, though not exactly the ſame in all, appeared to be little differing from that of cryſtal; the ſolid body exceeding the weight of the fluid water, it was weighed in, about two times and an half (a little more or leſs.)

Uſe I. TO apply this fundamental obſervation to the uſes deſigned in it; when I had a mind to make a probable diſcovery (for by this way I pretend to no more) whether in a ſtone, or ſtone-like body propounded, the merely ſtony matter were more or leſs commixed with ſome adventitious ſubſtance of a metalline nature, or that of ſome other mineral more ponderous than cryſtal, I carefully weighed

it,

it, firſt in the air, and then in the water, according to the method formerly declared; and if by virtue of its ſpecifick gravity, its proportion to water of the ſame bulk exceeded the proportion of five to two (which, to avoid fractions, may be commodiouſly ſubſtituted to that often already mentioned of $2\frac{1}{2}$ to one) I concluded it probable, that the concretion had in it a portion of adventitious matter, heavier in ſpecie than cryſtal or mere ſtone: by how much more or leſs the ſolid body exceeded the weight of water equal to it in bulk, by ſo much greater or leſſer a portion of heterogeneous matter was gueſſed to be commixed with the ſtony in the propounded concrete. This may be illuſtrated, as well as proved, by the examples, that ſhould preſently follow, but that it will be fit, before I deſcend to particulars, to premiſe a paper, that concerns the whole deſign of this tract.

CHAP. II.

THOUGH the way of weighing ſolids in water hath been delivered by the ingenious *Marinus Ghetaldus*, and, out of him, by ſome few other authors; and though therefore I might excuſably diſpenſe myſelf from delivering it diſtinctly; yet ſince their books are ſcarce, and the knowledge of this way is almoſt every where ſuppoſed in theſe papers, I hold it very fit, that it ſhould once be propoſed in this tract, not only for that reaſon, but for two others. One, that a dexterous way of finding out the weight of bodies in liquors may be of far more uſe than men ſeem to be yet aware of, being capable of being made, by a little variation and improvement, of good uſe to naturaliſts, and even to chemiſts. And the other, that perhaps you will find cauſe to think, that experience and reflections on it may have furniſhed me with ſome few expedients and cautions for the better practice of this art, and for the avoiding of ſome errors, that may be very eaſily, and perhaps have been, run into, for want of the cautions here given.

The way of weighing ſinking bodies in water.

THE ſolid body, given to be examined, is to be tied about with an horſe-hair of a competent length, which hair at its other end is to be faſtened to one of the ſcales of a tender and exactly equilibrated balance; ſo that the propoſed body being exactly weighed in the air, and then immerſed in a glaſs or other fit veſſel, almoſt full of fair water, may hang freely in that liquor, being on every ſide encompaſſed by it. This done, you muſt put into the oppoſite ſcale as many weights as ſerve to bring the body hanging in the water to an exact æquilibrium with the counterpoiſe, and conſequently the beam of the balance to an horizontal ſituation. Then take out the weights newly imployed, which give you the weight of the body in the water, and deducting it from the weight formerly taken of the ſame body in the air, and by the remainder, which will be the difference of theſe two, divide the whole weight of the given body in the air, and the quotient (whether conſiſting of whole numbers, or a fraction, or both) will ſhew the proportion, in ſpecifick gravity, between the examined ſolid, and as much water as is juſt equal to it in bulk. To make this more eaſily intelligible by an example; we took a fine piece of white marble (that ſtone ſeeming the moſt pure, and moſt free from mineral tinctures of any common opacous ſtones:) this being put into a good balance, whoſe ſcales were well equilibrated, was found to weigh in the air, ℥ii. ʒiii. ℈i. grains ix. which, for conveniency of ſupputation, we reduce to 1169 Grains; then an horſe-hair was tied about this piece of marble, and the other end of the ſame hair was faſtened to one of the ſcales, under which, at a convenient diſtance, was placed a ſomewhat deep glaſs, almoſt full of fair water: in this liquor the ſtone was made to hang freely beneath the ſurface; and in the oppoſite ſcale there were put weights enough to bring it to an æquilibrium with the other; theſe weights were found, being reduced to the former denomination, to amount to 738 grains, which gave us the weight of the marble in water (which was much leſs weight than the former, becauſe the ſtone was partly ſuſtained by the water:) this being ſubſtracted from the weight of the ſame ſtone in the air, there remained 431 grains, which gave us the weight of as much as was equal to the ſtone in bulk. By this remainder the weight of the marble in the air, *viz.* 1169, being divided, the quotient was found to be 2 and $\frac{738}{1000}$, or near enough $\frac{7}{10}$ for the proportion in ſpecifick gravity of white marble to water. The *demonſtration of this practice* is founded on what *I have elſewhere given; and it may*, in another way, be found in ſome of the commentators on *Archimedes de inſidentibus humido*. Hydroſtatical paradoxes.

FOR underſtanding of the ſummary direction newly given, it may be uſeful to ſubjoin the following notes: 1. It is manifeſt by the nature of the thing, that the body, propoſed to be weighed, ought to be heavy enough to ſink in water, ſince otherwiſe its weight in that liquor being none at all, cannot be ſignificantly deducted from its weight in the air. But if there be occaſion to weigh in water a body lighter in ſpecie than it, as bees-wax, a piece of fir-wood, *&c.* it may be done, though not without ſome trouble, by joining to it a body, heavy enough to make the wax ſink with it: but this caſe belongs not to this place.

2. AN horſe-hair is made choice of for hydroſtatical operations, becauſe it is ſaid to be equiponderant to ſo much water; and though I have not found that to be ſtrictly true, yet an horſe-hair is fitter to be imployed in theſe trials, than any other ſtring I know of; and its ſpecifick weight uſually differs ſo little from that of water, that the difference may be ſafely enough neglected; and if the ſolid propoſed be too heavy to be ſuſtained by a ſingle horſe-hair, one may twiſt two, or (if need be) more of them, to make the ſtring ſtrong enough to ſuſtain the ſolid.

3. I SHALL

3. I SHALL add, that I have met with bodies, about which, by reaſon of their roundneſs, as in bullets, or of ſome other inconvenient figure, we could not well faſten an hair, or other ſtring, wherewith to tie it to the balance. Now, on ſuch occaſions, I cauſed ſome hairs to be ſo contexed, as to make a kind of a little hoop-net, whoſe meaſhes were not great enough to let the body ſlip through them. In this ſmall veſſel, whether you call it a net or a baſket, which was tied by an horſe-hair (ſingle or twiſted) to one of the ſcales, we put the ſolid body to be weighed, and proceeded in the operation, as if the body were tied but with a ſtring.

4. BUT here it muſt be carefully noted once for all, that whenſoever any hydroſtatical trial is made with an horſe-hair, there muſt be put into the ſcale, that holds the counterpoiſe, as much of the ſame hair, as can be gueſſed to be of the ſame weight with that part of the ſtring, that ſuſtains the body in the water, which appears to be above the ſurface of the water; for this liquor takes off the weight only of as much of the hair as is immerſed in it, ſo that the unimmerſed part of the ſtring adds to the weight of the ſolid hanging in water, and therefore ought to be compenſated by an equal weight put into the oppoſite ſcale.

5. WHEN I kept a balance only or chiefly for hydroſtatical trials, I found it expedient, on divers occaſions, to take off one of the ſcales, with the ſtrings belonging to it, and ſubſtitute in its room a piece of lead, or other metal, of a conical, or ſome other convenient ſhape, exactly equiponderant to the oppoſite ſcale, and at the ſame end of the ſtring to faſten one end of the horſe-hair, that tied the body to be weighed in water. And ſometimes alſo, when I did not take off one of the ſcales, I cauſed it to be perforated in the middle (yet without leſſening its weight) that ſo the body to be immerſed might hang very perpendicularly from the midſt of the ſcale. The motives, that induced me to theſe practices, cannot be ſo well ſet down in few words; and therefore ſhall be now left unmentioned, eſpecially becauſe the practices themſelves, though on ſome occaſions convenient, are not neceſſary.

6. THERE remain yet a couple of remarks, which muſt leſs than any be pretermitted, if men would avoid ſome errors, that are but too often ſlipt into by the makers of hydroſtatical trials. We are then (firſt) to take notice, that the body to be examined hang freely in the water, ſo that no part of it any where touch the bottom or the ſides of the veſſel, or reach above the upper ſurface of the water contained in it; for, if any of theſe circumſtances be not taken care of (as it happens, when we are not heedful enough) the true weight of the ſolid is ſomewhat altered; and if any corner, or other part of the body (and the like may be ſaid of the horſe-hair it is tied with) though but a ſmall one, appear above the ſurface of the water; that extant portion, being not at all ſuſtained by the liquor, adds (more or leſs) to the weight, that the immerſed body ſhould have. Care alſo muſt be had, that as nothing but the water do touch the hanging body, ſo no part of the water may touch the ſcale whence it hangs. I have ſeveral times obſerved, that immerſed bodies have been concluded to weigh more in the water than really they did; becauſe, through ſuch a want of heedfulneſs, as is not uncommon, the experimenters did not take notice, that if the ſtring were too ſhort, or the veſſel too full, the vibrating motions of the balance would, at one time or other, carry down the ſcale the ſuſpended body was tied to ſo low, as to make one part or other of it touch the ſurface of the water; ſome drops of which liquor would readily ſtick to it, and, becauſe they adhered to the nether part of it, would lie concealed from an eye that was not prying, and by conſequence would ſenſibly add to the weight of the ſcale, and make the body be thought heavier than indeed it was; which overſight muſt needs be very prejudicial, when one makes experiments, that require exactneſs.

7. BUT the moſt uſual cauſe of miſtakes in hydroſtatical trials (eſpecially ſuch as are made on ſmall bodies) wherein a little error may be greatly conſiderable, is this; that men are wont to think it ſufficient (in theſe trials) that the body to be examined be totally immerſed in the water; whereas it does not only often, but moſt commonly happen, that the given ſolid, and the ſtring that is tied about it, carry down with them divers particles of air; and perhaps too it may find and extricate others, that lay concealed in the pores of the liquor itſelf; which aerial particles faſten themſelves to the little aſperities, that they meet with on the ſurface of the immerſed bodies, in the form of bubbles, which, like ſo many little bladders full of air, endeavour to buoy up the body they adhere to; and on that account do, in proportion to their number and bigneſs, leſſen the weight, which the immerſed body would otherwiſe have in water. And therefore great care is to be had, eſpecially in nice experiments, that, by ſhaking the ſtring, and warily knocking the body againſt the ſides of the glaſs, the adhering bubbles may be diſplaced, and emerge to the top of the water. And I ſhall add a deſire, that on ſome occaſions this caution be made uſe of more than once in the ſame trials; becauſe I have ſeveral times obſerved, that now and then after the immerſed body was freed from the firſt bubbles, that appeared about it, others did ſucceed, before an end was made of weighing the body; out of ſome of whoſe unperceived cavities or pores (whether ſuperficial or lying deeper) perhaps the latent air could not eaſily on a ſudden be driven by the water. I have been the more circumſtantial in explaining the ſummarily propoſed method of weighing bodies in water, becauſe experience hath ſhewn, that it is not near ſo eaſy as upon the firſt reading of it one would preſume, to be exact in the practice of it.

HAVING obtained the weight of a body propoſed, firſt in the air, and then in water, according to the method plainly delivered; it will not be difficult to diſcover practically the proportion in weight between the ſolid and

the liquor. I ſay practically, becauſe the rule is eaſy enough, though the demonſtration is not ſo readily to be underſtood by them, that are not acquainted with the principles of the hydroſtaticks. The theorem, upon which our practice is grounded, was firſt, that we know of, delivered by the moſt ſagacious *Archimedes*, whoſe commentators have buſied themſelves in demonſtrating it in a mathematical way, as I have ſince endeavoured to do in a phyſical way, and more eaſy to naturaliſts in the hydroſtatical paradoxes. *Archimedes*'s propoſition is this, *that a body heavier than water weighs leſs in water than in the air, by the weight of as much water as is equal to it in bulk or magnitude:* whence it is not difficult to deduce a rule ſufficing for our preſent purpoſe. For if you ſubſtract the weight of the body propoſed, whilſt it is every way environed with water, from the weight of the ſame body, which it was found to have in the air; the reſidual number or difference gives you the weight (taken in the air) of as much water, as is equal in magnitude to the ſolid propoſed; ſo that having now two bodies, one firm, and the other liquid, together with the weight of each of them apart; to find their proportion, you need but divide the greater by the leſſer, and the quotient compared to one, that is, to an unit, will be the antecedent of the proportion deſired between the ſolid body and the water, which is mentioned but as it is the liquor, that is generally employed in theſe experiments, for otherwiſe the rule will hold, *mutatis mutandis*, in other liquors, as well as in water.

CHAP. III.

AND now having premiſed theſe remarks, and thereby made way for the clearer underſtanding of the ſubſequent part of this paper, we ſhall proceed to the examples, that this not unneceſſary digreſſion has diverted us from propounding.

THERE is a deeply red and opacous mineral, that commonly paſſes in the ſhops under the name of lapis hæmatites, though it ſeems to have more affinity to that, which divers authors call ſchyſtos. But whatever be the moſt proper name that belongs to it, it is an hard foſſil, which, though little uſed by our Engliſh phyſicians, is in ſeveral places abroad in great requeſt; and that not without cauſe, as far as I can judge, by what I yet know of it; and eſpecially for that ſomniferous quality, that may be obſerved in ſome of its preparations. But it is not here, though it is elſewhere, my purpoſe to deliver its medicinal virtues; but only to examine, whether, according to our method, it ought to be concluded to abound with metallick particles (perhaps but embrionated) to whoſe intermixture ſome of its virtues may probably be aſcribed. Therefore, in a very good balance, having weighed a piece of Engliſh hæmatites, that chanced to amount to about ʒiii. ʒii$\frac{1}{2}$, firſt in the air, and then in water, we found its proportion to this liquor, as $4\frac{15}{100}$ to 1. At which ponderoſity, if I had not formerly made the like experiments, I ſhould have been ſurpriſed, as you probably will be, when you conſider, that this metalline ſtone did not very much want of almoſt twice the weight of a mere ſtone of the ſame bulk. This great weight much confirmed me in the conjecture I had made, that in this lump was contained a good deal of metalline ſubſtance. And this induced me (to add that upon the by) to examine my gueſs, by ſubliming it, when finely powdered, and diligently mixt with an equal or double weight of ſal armoniac. For then having taſted, with the tip of my tongue, of this ſaffron-coloured ſublimate, I found it, as I expected, very aſtringent or ſtyptick, as divers preparations of *Mars* are wont to be; and, for further proof, having put leſs than a grain of it into a ſpoonful or two of good infuſion of galls, there was immediately produced a black, and as it were inky mixture.

LAPIS lazuli is ſometimes made uſe of by European phyſicians, but more frequently by Arabian and other Eaſtern ones, for divers purpoſes, but eſpecially to make evacuations by vomit. This emetick faculty ſeemed likely enough to belong to it upon the ſcore of a metalline ingredient; and accordingly, having examined hydroſtatically a piece, that was judged moderately rich, we found the proportion of it to an equal bulk of water, to be as 3 to 1; which argues, that, notwithſtanding its briſkneſs in operation, it contained a much leſſer proportion of metalline ſubſtance, than lapis hæmatites, or divers leſs operative minerals.

Obſervation about the loadſtone, as it is a mineral.

I ELSEWHERE ſhew, that the loadſtone may be applied to medicinal uſes; and that it emits effluvia, that are not magnetical, and may have ſenſible operations upon the body of man. On which account it was not improper to examine it hydroſtatically; by which means I found, that the weight of a lump of loadſtone, that I judged to be either Engliſh or Norwegian, was in proportion to water of the ſame magnitude, as $4\frac{93}{100}$ to 1. But of the ſpecifick gravities of loadſtones much more may be met with in another paper.

LAPIS calaminaris is often enough uſed in phyſick, eſpecially by chemiſts, to dry, and to imbibe acidities; for which uſes, I prefer it before divers more famous drugs. But, though it is wont to be employed only as an external remedy, yet ſome things, that I found in ſome uncommon chemical preparations of it, made me think, it may deſerve to be further examined and tried. A famous and not unlearned empirick, to whom I willingly communicated ſome proceſſes, that he deſired of me, when I aſked him about a medicine, whoſe ſucceſs brought him a great number of patients, for griping fluxes, and ſome dyſenterical ones, candidly diſcovered his medicine to me, and ſolemnly aſſured me, it was nothing but pure and well-ground lapis calaminaris, ſeaſonably given in a juſt doſe; as in a fitter place I have more fully declared. This made it obvious for me to conjecture, that lapis calaminaris participates of a metallick nature, as may be argued from its operation upon copper, which is thereby

turned into braſs. Wherefore weighing a piece of this foſſil, firſt in air, and then in water, it appeared to be to this liquor as $4\frac{62}{100}$ to 1.

If I had not among other papers loſt ſome, wherein I had regiſtered a good number of trials of this kind made upon differing foſſils, it would be eaſy for me to add, to the four already recited, others manifeſtly conducing to the ſame purpoſe. But preſuming, that thoſe already delivered may at preſent ſuffice, I ſhall now ſubjoin a few obſervations, whereof the firſt may become the candor and impartiality of a lover of truth, and the reſt intimate ſome further uſes of the hydroſtatical way of exploring hard and ponderous concretions, hitherto treated of.

I must not therefore forbear to admoniſh you, that, though when an hard foſſil propounded, is found to be much heavier than cryſtal of the ſame bulk; it is a very probable token, that in the ſolid concretion, there is a notable portion, greater or leſſer, of ſome metalline or other ponderous mineral body, whence its good or evil qualities, in reference to human bodies, may probably be deduced. Yet, this hinders not, but that it is very poſſible for a foſſil to be endowed with medicinal virtues, or to have noxious qualities, on the account of a portion of extraneous matter; though its ſpecifick gravity doth but little exceed that of cryſtal, or the advantage ſeem but inconſiderable. For (to paſs by other reflections) a very ſmall proportion of adventitious, metalline, or mineral ſubſtance, if it be of an operative nature, may, in ſome caſes, ſuffice to diffuſe its ſelf through the reſt of the maſs, and impregnate it with active qualities. Which may be partly illuſtrated, and partly proved, by ſome experiments, that will be hereafter met with in one of the chapters.

CHAP. IV.

Uſe II. To hint ſomewhat about the further utility of our hydroſtatical way of enquiry, I ſhall take notice in the firſt place, that it may aſſiſt us to gueſs with probability, whether a mineral body propounded, as likely to be a ſtone, or of a ſtony nature, be ſo indeed. Thus coral, for inſtance, is by ſome thought to be a plant; by others a lithodendron; but by the greater number it is reckoned among precious ſtones. In this diſſent of opinions, the ſpecifick gravity may be of conſiderable uſe. Wherefore, we thought fit to weigh a piece of choice and well coloured red coral, firſt, in the air, and then in the water, and found its proportion to the weight of as much of that liquor, to be as $2\frac{68}{100}$ to 1. So that its ſpecifick gravity much favours their opinion, who take it to be a ſtone, ſince it not only equals that of cryſtal, but ſomewhat exceeds it.

There are ſome, that will have pearls, becauſe of their hardneſs, and their being treated of by jewellers, and others that write of gems, to be of a ſtony nature. Wherefore I thought fit to examine their ponderoſity alſo. But not having now with me any trial of that kind, I ſhall ſubſtitute one that I made upon a monſtrous pearl, that was preſented me by a perſon, that took it out of the oiſter. I call it monſtrous, becauſe though it be well enough coloured, yet its ſhape is irregular, and its bigneſs extraordinary, as is alſo its weight, amounting to full 206 grains. This being weighed in water, its proportion in gravity to an equal bulk of the liquor was found to be as $2\frac{51}{100}$ to 1. So that its ſpecifick weight was much about the ſame with that of cryſtal.

There are many, that take the ſtones formed in mens bladders for as true and genuine ſtones, as thoſe that nature forms in the greater world; and ſpeak much, and ſometimes not without ground, of the great hardneſs of divers of them. But, though I deny not, that, in a laxer ſenſe, they may well enough paſs for ſtones, yet I ſhould rather call them animal ſtones, than ſimply ſtones; this name having been conſtantly and generally uſed to ſignify mineral or foſſil ſtones: which, by our way of exploration, may be eaſily diſtinguiſhed from human calculus's, and other like hard concretions, found in the bodies of ſome animals. For, having examined a good number of theſe ſtones, I found, that not only the chemical analyſes I made of them, of which I elſewhere give an account, manifeſted them, how hard ſoever they were, to be concretions belonging to the animal kingdom, not the mineral; but, by an hydroſtatical examen of divers of them, I found them to differ much in ſpecifick gravity from true foſſil ſtones. Of this you will, in its proper place, meet with ſeveral inſtances; ſo that it may here ſuffice to mention two, that now chance to come to hand; namely, that a calculus humanus weighing above ʒviſs was found to be in proportion to an equal bulk of water, as $1\frac{76}{100}$ to 1. And another, that weighed ʒiv and above an half in the air, being alſo weighed in water, appeared to be to this liquor, as $1\frac{69}{100}$ to 1.

I mention theſe ſtones as belonging to the materia medica, though they are looked upon rather as diſeaſes, of which, indeed, they are very ſad productions, becauſe a famous and experienced phyſician, that practiſed long in the *Eaſt-Indies*, and had better opportunity than almoſt any European had before him to try the virtues of bezoar, does either equal or prefer the calculi we are ſpeaking of even to oriental bezoar.

And to ſhew, that men are not the only animals, wherein ſtone-like concretions differ in ſpecifick gravity, (and ſo may be diſtinguiſhed by that difference) from cryſtal and ſuch like true ſtones; we ſhall ſubjoin two or three experiments, made upon choice bezoar ſtones, not exceeding a middle ſize, ſuch being the likelieſt not to be adulterated. The firſt of theſe weighing in the air ʒiij, and odd grains, was found to be in proportion to water of the ſame bulk, as $1\frac{47}{100}$ to 1. Another weighing ſomewhat leſs than ʒiij, was to the weight

weight of an equal bulk of water, as $1\frac{53}{1000}$ to 1. I might add divers other inſtances of the like import; and though I think them not neceſſary, yet I ſhall ſubjoin one more, becauſe it is afforded by a bezoar ſtone, taken out of another of the ſame kind: this kernel ſtone, if I may ſo call it, being weighed in the air, wanted nine grains of ʒiij, and its proportion to water of the ſame magnitude, was found to be as that of $1\frac{55}{1000}$ to 1. In all which inſtances we may obſerve, that theſe animal ſtones, not amounting to twice the weight of water, equal to them in bulk, have leſs of ſpecifick gravity by above a fifth part, than a true foſſil ſtone (ſuch as cryſtal) is wont to be endowed with.

CHAP. V.

Uſe III. THE uſe lately propoſed of our hydroſtatical way of exploration ſuggeſts to me another, which may be deduced from it as a kind of corollary.

THIS comprehends two ſomewhat differing ways of applying the obſervations we have lately mentioned. For firſt, we may by the hydroſtaticks be aſſiſted to diſcover, with probability, the reſemblance, or the difference, that may be between bodies of the ſame denomination, ſo that ſome ſubordinate ſpecies of them may perhaps be diſtinguiſhed, as well as ſeveral individuals of the ſame, or lowermoſt ſpecies. Since, for inſtance, we have found a notable difference between the ſpecifick weights of ſeveral loadſtones, that were dug up in ſeveral countries or mines; if greater number and variety of experiments of this kind were made, we ſhould poſſibly find that, *cæteris paribus*, the loadſtones of one country, or of one mine, are conſiderably heavier than thoſe of another; as, if I miſtake not, I uſually obſerved, the Norwegian and the Engliſh loadſtones to be heavier in ſpecie, than thoſe that are ſaid to come out of a warmer region, *Italy*; whoſe iſland of *Elba* abounds with mines, whereof I ſaw one intire maſs, that I judged to weigh a great many hundred of pounds. And this difference of weight between foſſils of the ſame kind, when it is conſiderable, may be of good uſe to help us to diſtinguiſh between the ſtones of the ſame loweſt ſpecies, that are proper to differing countries or mines. But, in caſe the unequal weight proceeds, as it often does, from an adventitious matter, that inſinuated itſelf into the more genuine matter of the foſſil, whilſt it was fluid or ſoft, it may much aſſiſt us to gueſs at the greater or leſſer purity of the homogeneouſneſs of the foſſil propoſed; which diſcovery may, on divers occaſions, be of no ſmall uſe to the phyſician, the jeweller, or the naturaliſt.

CHAP. VI.

Uſe IV. BUT the ſecond thing compriſed in our corollary may in divers caſes be of much greater utility and importance, as being very proper to help us to diſcern genuine ſtones, whether animal or mineral, from counterfeit ones; which too often paſs for true, to the great prejudice of phyſicians and patients, and the great loſs of lapidaries, and their cuſtomers. For as there are few qualities appertaining to ponderable bodies here below, that are ſo radicated (if I may ſo ſpeak) as their ponderoſity is; ſo there is ſcarce any quality, wherein 'tis ſo difficult for impoſtors to make a notable alteration unperceivedly, as the ſpecific gravity. I ſaid, for impoſtors; becauſe, though in ſeveral caſes, it is not ſo very difficult, to alter the ſpecifick weight belonging to this, or that kind of bodies; yet in thoſe very caſes, it may be exceeding difficult, and perhaps impractible, to make a conſiderable change in that quality, but by ſuch additions, or operations, as will make a ſenſible change in ſome other qualities too, and thereby expoſe the fallacy to be diſcovered. And this will eſpecially prove difficult in many caſes to vulgar cheats, and counterfeiters, or adulterators of gems, and other valuable minerals; becauſe the little knowledge they have of the numerouſneſs and variety of natural and artificial productions, confines them to a ſmall number and diverſity of means, to accompliſh their fraudulent deſigns. And whilſt they are intent but upon counterfeiting the more obvious qualities of things, and perhaps of eluding the known and vulgar trials men are wont to acquieſce in, they are not like to take care to maintain the ſpecifick gravity, and ſecure their adulterated wares, againſt an hydroſtatical way of examen, which, probably, they never ſo much as heard of. By this means, ſeveral pearls, for inſtance, may be diſcovered to be counterfeit, without in the leaſt injuring them. And I remember, that ſome fictitious corals, that, for divertiſement, I made, to ſhew what might be done in that kind, were, notwithſtanding their fine colour, ſhape, and gloſſineſs, eaſily diſcoverable, by their having a ſpecifick weight manifeſtly exceeding that, which belongs to natural corals.

BEFORE I knew better ways, I have ſometimes, for recreation, by the help of minium, made paſtes, or fictitious gems, which, though tranſparent, and finely enough coloured, yet, becauſe they contained ſome vitrified lead, added to the other ingredients, to promote the fuſion, were liable to be detected by an eaſy hydroſtatical trial of their ponderoſity. I have likewiſe ſeen a fair bezoar-ſtone, that ſo reſembled a genuine ſtone, that a great price was ſet upon it. But being brought me to be judged of, I made little doubt of its being counterfeit, by reaſon of its appearing to me as heavy as a mineral ſtone of that bulk; though the poſſeſſor being loth to expoſe it to an uncommon trial, I could not ſo cogently evince, that I had a clear reaſon to diſadviſe the purchaſe of it.

CHAP. VII.

Uſe V. AFTER theſe inſtances, (which are not the only, that might be alledged of this kind) the affinity of the ſubjects invites me to take notice of another uſe, or at leaſt, a variation of the former, which may be made of our hydroſtatical

ſtatical way of examining ſolids. For it may, on divers occaſions, aſſiſt us to make probable eſtimates of the genuineneſs, or the degree of purity of ſeveral bodies, that are, or may, uſefully be employed in phyſick, though they be not ſtones or minerals, provided they be heavy enough to ſink in water. For when we have once found the ſpecifick gravity of a concretion of this ſort, that we know to be genuine, and well conditioned in its kind; this degree of ponderouſneſs may ſerve us for a kind of ſtandard, whereby to judge of others of the ſame denomination, or that are ſaid to be of a like nature.

To illuſtrate a remark, that has no more of difficulty in it than this, fewer inſtances will ſuffice, (if any be neceſſary) than you will meet with in the following part of this tract, wherein they will opportunely occur. And therefore, inſtead of ſetting them down in this place, I chooſe to give you an advertiſement, that would ſurpriſe you, if I had not formerly hinted ſomewhat applicable to the ſame purpoſe, by no great variation. For that which I am about to ſerve you, is, that I think there ſhould be made a great difference between the eſtimate, that men make of ſome ſtones, to which the ſhops give the name of gems, according as the eſtimate is to be made by jewellers and goldſmiths, or by phyſicians and chemiſts. For the tradeſmen, who uſually aim but at the beauty and luſtre of the gems they would ſell, may juſtly eſteem thoſe, *cæteris paribus*, the beſt, that are in ſpecie the lighteſt, becauſe ſuch are generally more uniform as to ſenſe, and more tranſparent; and alſo receive their colour from pigments of finer parts. But, on the contrary, thoſe, that in gems ſeek mainly, if not only for the medicinal virtues, may juſtly value thoſe moſt, that are moſt ponderous; as having more plentiful portions of the metallick or mineral ſubſtances, whence the greateſt part of their virtues is, as has been formerly noted, in probability to be derived. And this difference in ſpecifick weight, in ſtones that have the ſame name given them, I ſometimes found to be far greater than one, that has not tried it would imagine; as may appear by ſome inſtances applicable to this argument, that will hereafter be met with. But yet, I would not hence infer, that even ſuch ſtones, whether tranſparent or not, as appear fine, and are but light in their kind, muſt be devoid of particles, whether metalline, or of kin to them, whence they may be endowed with conſiderable medicinal virtues. For there are mineral pigments of ſo ſubtile a nature, that ſo ſmall a quantity as will ſcarce make them ſenſibly heavier than gems that are leſs, or perhaps not at all coloured, may be diffuſed through the whole matter, and at leaſt impregnate every ſenſible part of it. This I ſhall illuſtrate by the following experiment, deviſed for that purpoſe.

Five grains of powdered zaphora, being mixed with ℥j. ʒß. of finely powdered Venice glace, and kept a full hour in fuſion in a furnace, that gives an exceeding violent fire, afforded a tranſparent maſs, that was throughout of a fine blue colour, and that deep enough; ſo that one part of the pigment ſufficed to tinge by fuſion above an hundred parts of the glaſs: and when for curioſity we made the proportion of the zaphora a little greater, taking eight grains of the pigment to ℥j. of glaſs, that is, one to ſixty; the mixture having been kept for the like time in ſtrong fuſion, the maſs was ſo deeply coloured, that the proportion of the tinging ſtuff to the reſt of the water appeared too great to make a handſom gem.

And further to manifeſt, that a quantity of metalline matter, though it be but very ſmall, may ſuffice to give a tincture, and ſo to impart a virtue to a glaſſy body, and even to gems; I ſhall add an experiment, that perhaps you will think ſomewhat ſtrange. I had long conjectured, that there was in granates, eſpecially in ſome that were deeply coloured, pretty ſtore of metalline corpuſcles of a martial nature; and that thoſe corpuſcles are more than ſufficient for the granate itſelf, into whoſe compoſition they enter, though not viſibly, becauſe of their extreme minuteneſs. Upon this ſuppoſition, I took a Bohemian, or rather German, granate, (for I never ſaw any Bohemian ſo large) that I had kept by me for a rarity, becauſe of its bigneſs and deep colour, though it was not a fine ſtone to look on, notwithſtanding its being tranſparent in thoſe edges that were thin. This being reduced to very fine powder (but not in an iron mortar, leſt it ſhould take ſomething from the metal) we exactly mixed eight grains with an ounce of finely pulveriſed cryſtalline glaſs; afterwards the mixture was kept two hours in a furnace, that gives a ſtronger fire than ordinary wind-furnaces, by which means we obtained, as I expected, a pretty uniform maſs tinged of a ſufficiently green colour, ſuch as prepared iron or ſteel gives to pure glaſs.

CHAP. VIII.

WHAT has been hitherto delivered, may ſerve to ſhew, in ſome meaſure, the uſes of our hydroſtatical way of examining drugs, upon a ſuppoſition, that they are ſolid, and neither very minute, nor too light to ſink in water. But I muſt not forbear to confeſs, and even give notice, that there are many ſimples and other ponderable ſubſtances, that may, upon good grounds, be ſaid to belong to the materia medica; which yet want one, or more, of the newly expreſſed conditions. Wherefore I muſt not conceal, that there are three things, which, though not neceſſary to the underſtanding of the uſefulneſs of the foregoing part of this diſcourſe, may, if they can be performed, much conduce to facilitate (for I dare not ſay to compleat) the hydroſtatical way of examining bodies heavier in ſpecie than water. And therefore, though I confeſs it no eaſy taſk to ſurmount the difficulties to be met with in this attempt, yet I ſhall endeavour to leſſen them as much as I can, by offering to you the expedients, that I was wont

formerly to make uſe of in the three caſes I am about to mention: namely, firſt, when the body to be examined was liquid, and conſequently could not be immediately taken hold of by an horſe-hair, or any other ſlender ſtring. Secondly, when the body propoſed was either in the form of powder, or conſiſted of fragments, that were ſo ſmall, that it was not poſſible, or at leaſt not fit, to faſten each of them to an hair, and ſuſpend it after the manner of a body of a greater bulk. And thirdly, when the ſolid to be hydroſtatically examined, though great enough in bulk to be tied about, was diſſoluble in water, and conſequently unfit to be weighed in that medium; ſince therein its gravity muſt continually decreaſe, whilſt the operation was performing.

As to the firſt of the three difficulties lately mentioned, I ſuppoſe I need not ſolicitouſly premiſe, that the liquid ſubſtance to be hydroſtatically examined ought to be heavier in ſpecie than the water, or other fluid it is to be weighed in, and of ſuch a nature, as not to be apt (at leaſt ſpeedily) to mingle itſelf with it; ſince otherwiſe the propoſed liquor will either emerge in that it ſhould be weighed in, or elſe be confounded with it, and ſo retain no diſtinct maſs or gravity.

SUPPOSING then, that the liquor to be examined, has belonging to it the two newly recited conditions, we made uſe of this expedient to explore its ſpecifick weight. We took a ſmall jar, or wide mouthed glaſs, capable of containing an ounce or two of common water, and weighing in the air, about three or four drachms (more or leſs, as occaſion requires.) This glaſs, which, for brevity's ſake, we are wont to call hydroſtatical, or elſe glaſs-bucket; we weigh very carefully once for all, firſt in the air, and then in the water, and by the difference of the weights we find, according to the known hydroſtatical method, a weight equivalent to that of the ſubſtance of the glaſs in water; ſo that ſuch a weight being put into the oppoſite ſcale of the balance, the veſſel hanging under the ſurface of the water may be conſidered as having no weight at all, that is, no preponderancy. And conſequently, the weight of a body contained in this bucket may be looked upon as that of the body itſelf in water, without being increaſed by that of the veſſel; ſo that in our inſtance, the bucket makes a maſs of quickſilver, though fluid, as ponderable as if it were coagulated into a ſolid body.

THE glaſs-bucket being thus provided once for all, we put the propoſed mercury into it, and weigh them together in the air; whence deducting the already known weight of the veſſel itſelf in the air, the reſidue gives the weight of the quickſilver alone in the air. This done by the help of an horſe-hair, we tie the bucket to one of the ſcales, (or to either end of the beam) and letting it, with the quickſilver in it, ſlowly ſink into a glaſs, or other veſſel, competently full of fair water, and hang ſo, that the bucket may not any where touch, either the bottom, or the ſides of the larger veſſel; we reduce by weights, put into the oppoſite ſcale, and added to the formerly mentioned counterpoiſe of the bucket in the water, the balance to an exact equilibrium, without raiſing the bucket quite to the ſurface of the water: this newly obtained weight of the immerſed quickſilver being deducted from its weight in the air, it is eaſy, by the known hydroſtatical method, to obtain the proportion in gravity between the given mercury and an equal bulk of water.

To expedite this operation, it may be convenient to have in readineſs (as I was wont to do) a couple of weights of lead or tin; the greater exactly equal to the weight of the glaſs-bucket in the air, and the other equal to the weight of the ſame bucket in water. For by keeping theſe two weights conſtantly in readineſs, one has at hand a counterpoiſe of the veſſel, in which ſoever of the two mediums it is employed in, which ſaves them, that have frequent occaſion to uſe the balance, much of the time, that muſt otherwiſe be ſpent to adjuſt it.

THIS advertiſement being premiſed, the lately propounded operation will be beſt underſtood by an example. We took a ſmall glaſs jar capable of holding about ℥ß. of water, and put it into one ſcale of a tender balance, whoſe other ſcale we furniſhed with a counterpoiſe, or weight equal to the glaſs. Into this little veſſel we then put ℥i, that is, four hundred and eighty grains of mercury, (affirmed to be Spaniſh, which is counted the richeſt) and the glaſs with this mercury in it was, by an horſe-hair, made to hang from one end of the ſcales into a deep glaſs veſſel of water. Whilſt it was in that ſtate, there was in the oppoſite ſcale a counterpoiſe to the glaſs itſelf in the water, ſo that the drachms and grains, that it was requiſite to add, gave us the weight of the quickſilver only, the weight of the glaſs being already accounted for. But care was firſt taken, that the open mouthed veſſel ſhould be every where environed with water, and diligently freed from adherent bubbles; and that a piece of horſe-hair ſhould be added to the counterpoiſe, to compenſate that part of the ſtring or hair tied about the bucket that was in the air, intercepted between the ſcale it was faſtened to and the ſurface of the water. By this means we found the weight of the quickſilver in that liquor to amount to 446 grains, which being ſubſtracted from the weight of the quickſilver in the air, the difference was 34 grains, by which the greater number being divided, the quotient was 14 and about $\frac{1}{10}$. So that the mercury employed in this operation, appeared to be in gravity to water of the ſame bulk, as $14\frac{1}{10}$ to 1. I ſaid the mercury employed in this operation, becauſe in former trials I ſcarce found common quickſilver, that was bought in ſhops, to weigh full fourteen times, and ſometimes ſcarce 13 and $\frac{1}{2}$ as much as a bulk of water equal to it. Whether the ponderouſneſs of our laſt uſed mercury proceeded from hence, that as ſome chemiſts extol Spaniſh mercury, as participating more than others of a golden nature, (which opinion, a trial, that I purpoſely made of that employed

employed about the late experiment, did not disfavour;) so there was in this of ours something of unfixed gold, that somewhat encreased its weight, I leave to further enquiry.

If you can command, as I cannot, the learned *Ghetaldus*'s *Archimedes promotus*, since, as I am informed, he there sets down the intensive weight of quick-silver hydrostatically found, it may be worth your while to consult that scarce book, and compare the things you may meet with there, relating to quick-silver, with what I have now delivered. To which I shall add, that this I may here give you notice of in general; that having, on chemical and other accounts, had more occasion than most men, to make trials of this sort, I did not find all running mercuries, though they did not appear adulterated, to be precisely of the same weight: nay, even distilled mercuries, if once combined with metalline bodies, and particularly, if they were animated, and drawn from fine gold, I found to differ more from common mercuries sold in shops, than these did from one another; and even between common mercuries, notwithstanding their having been distilled, we found a notable disparity. But to enlarge on this subject were improper in this place, where I mentioned the weight of mercury; but to give so clear (though but single) an instance of the way of measuring the weight of ponderous liquid bodies in water, as may warrant me to say, that, by this method, though not always with the same ease, we may explore the specifick weight of other liquors, that are in equal bulk heavier than water, and yet are indispos'd to mingle with it; such as are the chemical oils of cinnamon, cloves, guaiacum, *&c.* But the chief thing, that has made me the more circumstantial in delivering the foregoing experiment, was, that this practical direction, for weighing one liquor in another, will hereafter appear to be applicable to useful purposes; especially when we come to mention, in the following chapters, several cases, wherein liquors of a nature very different from water, may be substituted in its stead.

CHAP IX.

As for the way of examining hydrostatically the powders of sinking bodies, such as minium, putty, *&c.* or such small solids, or fragments of greater ones, as by reason of their littleness or inconvenient shape, are singly unfit to be tied with an horse-hair to the balance, as the fragments of rubies, and other precious stones, wont to be sold by weight at the druggsters or apothecaries shops; the way of discovering the weight of these in water differs not much from that lately delivered of weighing quick-silver in that liquor. For on these occasions also, we employ such a glass bucket, as was lately described; and having made it very dry, as well within, as without, we put into it the metalline calx, or other heavy powder, or a convenient quantity of the fragments of gems, or a competent number of small, though entire bodies, as pieces of native cinnabar, seed-pearl, *&c.* and proceed with these as we did with quick-silver. Only this caution is to be heedfully taken along, that we warily, and little by little, put into the bucket, whilst it is yet kept in the air, and hath the already weighed powder, or fragments in it, a convenient quantity of the same water it is to be weighed in; that the liquor may have time to insinuate itself between the dry bodies, and even the corpuscles of the powders, and expel thence the air, that was harboured in the intervals betwixt them; which little aerial portions, if not thus seasonably expelled, would, upon the immersion of the vessel, produce in the water store of bubbles, that would buoy up, or fasten themselves to the fragments, or other small bodies, and make the experiment uncertain, or fallacious. And if it be a powder, that is to be weighed, unless it be before hand throughly wetted, and thereby freed from aerial particles, and reduced to a kind of mud, there is danger, that some dry corpuscles of the powder will, when the vessel is under water, be buoyed up, and get out of it, and, floating on the surface of the incumbent water, take off from the true weight, that the immersed powder should have in that liquor.

If this way of examining bodies be carefully employed by a dexterous man, furnished with a tender balance, it may be of considerable use, not only to physicians, druggists, and apothecaries, that are conversant with the more precious kinds of sinking bodies, that belong to the materia medica, but also to lapidaries, and goldsmiths, whom it much concerns not to be imposed upon by counterfeit gems, or by other stones of price, that are not duly conditioned, in their kind. Thus the fragments of the five precious stones, that (upon what grounds I now enquire not) are made ingredients of some noble compositions, as confectio hyacinthi, *&c.* these fragments, I say, may each sort of them apart be usefully examined by their weight in water, by him, that knows the true specifick gravity of a parcel of the finest, or else of such as he judges to be fittest for his purpose. And, to add that upon the by, whereas granates are reckoned among the five medicinal precious stones, and in some pharmacopœa's are preferred to the first place, as the best; I have found so great a difference, in point of ponderosity, between European granates and American ones, whereof some were sent me as a present from *New England*, and others I myself picked plentifully enough out of an odd Americal mineral, that I suspected to contain them, that it was very obvious to think their virtues might be very different, if not as to kind, yet, at least, as to degrees. And not only such fictitious pearls as have deluded many, and sometimes even famous jewellers (as one of themselves, that was lapidary to a great monarch, confessed to me) may oftentimes by this expedient be discovered, especially if mercury (though disguised) be employed in making them; but we may probably by the same method discriminate the natural pearls of several countries and sorts,

whereof

whereof I have ſeen a far greater difference than one would expect; and I have ſomewhere yet by me natural pearls of ſuch various colours, as well as ſhapes, as have ſomewhat ſurpriſed even the curious. But becauſe it more concerns phyſicians and patients, to be able to make eſtimates of ſeed-pearl, that are on many occaſions of good uſe to health, than to know the genuineneſs of thoſe bigger ones, that are ſeldom made uſe of, but for ornament; I ſhall here mention the reſult of an experiment, which I find among my old notes to have been made by me, when I was furniſhed with very fine oriental ſeed-pearls. For having examined theſe, by the way we are now diſcourſing of, as judging them orient enough to be fit to be patterns, wherewith to compare others, we found theſe to water of the ſame bulk, $2\frac{75}{100}$ (*i. e.* $\frac{1}{4}$) to 1.

BUT in this, and in thoſe other trials, whoſe difficulty, or importance, require, that we make them as exactly, as we are able, I muſt advertiſe you, that it is not fit to truſt to the ſteadineſs of your hand in holding the balance, but that you make uſe of a gibbet (as they call it) or ſome other ſtable prop to ſupport it. For the hand often ſhakes, and makes the inſtrument, that it holds, to do ſo, and oftner grows weary before the ſcales have had time to play up and down, and at length ſettle in a determinate ſituation; wherein if you miſs of a true æquilibrium, the hand muſt undergo a new penance: whereas, when the balance hangs on a ſtable fulcrum, you have both your hands to help you, and need not be tempted by wearineſs to deſiſt, before the balance be brought to reſt in a perfect æquilibrium. The neglect or omiſſion of this practice I take to be one main reaſon (for the want of good balances, or of ſkill to uſe them, is oftentimes another) why ſo many of the experiments, that require weighing, are erroneous; as they that cautiouſly examine them (as I have ſometimes had occaſion to do) may eaſily find. And therefore (to add that, upon the by) I hope you will not make haſte to cenſure the accounts I give of hydroſtatical trials, becauſe they do not always agree with thoſe of other mens; ſince perhaps they did not employ either more diligence, or better inſtruments, than I.

CHAP. X.

THE laſt of the three caſes, formerly mentioned: namely, 'What is to be 'done, when the body to be hydroſtatically ex-'amined will diſſolve in water, or eaſily mingle 'with it?' imports a queſtion difficult and troubleſom enough to be reſolved. Nor can this examen be performed by a ſingle operation, which yet ſufficed in each of the two foregoing caſes. And having ſeriouſly conſidered the matter, the beſt expedient I could then think of was that, which divers years ago I propounded in an aſſembly of the Royal Society, and grounded on this reflection, that though the body propoſed could not be immediately weighed in water, yet we may ſubſtitute another liquor, that will not diſſolve it, and thereby inveſtigate the ſpecifick gravity, in reference to that medium; and then, by comparing the difference of thoſe two liquors in point of gravity, one may come to diſcover, what the body propoſed would have weighed in water, in caſe it could have been kept there a competent time, without having any part of it diſſolved. Conſidering then, that, except quick-ſilver, the viſible fluids we can command, are either of an aqueous, or of an oily nature; and that moſt bodies, whereof we can make ſolutions in liquors of the former, will not (at leaſt ſenſibly) ſuffer themſelves to be diſſolved by thoſe of the latter kind, whilſt a propoſed ſolid is weighing in them; we preſumed, that the moſt ſaline bodies, ſuch as alum, vitriol, ſal gem, to which may be added borax, ſublimate, *&c.* might be commodiouſly weighed in oleous liquors. Among theſe I made choice of oil of turpentine, rather than oil-olive, or any chemical eſſential oil; partly, becauſe, being of common uſe, it is to be procured in ſufficient quantity, and, being very cheap, is ſeldom adulterated, as chemical oils are too often found to be; and, partly, becauſe, being a diſtilled body, it may be preſumed to be free from aqueous parts, of which experience has ſhewn me, that common expreſſed oil is far from being deſtitute. But becauſe two liquors, that are indeed both of them oils, are wont to have diſtinct names given them in the ſhops, I ſhall here intimate, that I do not, when I have my choice, make uſe of that which many call the oil of turpentine, but of that which firſt comes over, which thoſe, that diſtinguiſh them, call the ſpirit of turpentine: I prefer this (I ſay) becauſe it is clear, almoſt like fair water; whereas, that which is called the oil, beſides that it is leſs fluid, is commonly of a yellow colour, which does leſſen its tranſparency, and may be compounded with ſome of the coloured bodies to be weighed in it.

THERE are many perſons, that would find it very difficult, and to whom, on moſt occaſions, it will not be neceſſary, to know the determinate proportion in gravity between oil of turpentine, and the ſolid that is weighed in it; and to diſcover, by the help of that gravity, what the body propoſed would weigh in water, in caſe it could be kept for a competent time in that medium, without having any part of it diſſolved therein. And therefore, though, if you deſire it, I ſhall, God permitting, annex the method of performing this taſk (which, you know, requires more calculation, than every common reader is able to go through with) to the end of this tract; yet, for the preſent it may perhaps be ſufficient, as well as fit, that I give you notice, that thoſe, that have not ſkill enough to determine, by the hydroſtaticks, the proportion between ſinking ſolids, and the liquor they are weighed in, may yet be aſſiſted by what we have delivered about oil of turpentine, to make a not unuſeful eſtimate, what is the ſpecifick gravity of divers bodies, in reference to others of the ſame, or a differing ſpecies; and by that

means, to make a probable gueſs, whether or no it be rightly conditioned; if he be but provided with one piece of the body, which he knows to be genuine or well qualified. For this may ſerve him as a ſtandard, whereby to examine other bodies of the ſame denomination, that he may have occaſion to purchaſe, or to ſell, or to employ. As, ſuppoſe a tradeſman be to buy a parcel of ſublimate, he may take an ounce, for inſtance, or half an ounce of ſome of that he knows to be good, or rightly made; then having carefully weighed it in oil of turpentine, and ſet down how much it weighs therein; if he takes an ounce, or half an ounce of the ſublimate, he would make trial of, he may weigh that, as he did the other, in the ſame liquor, wherein if it give the ſame weight with the ſtandard, it is a good ſign; but if it weighs not ſo much, it is a ſign, that it has not its full or due proportion of mercury, and too great a proportion of ſalts, whence its comparative lightneſs proceeds. The ſame way of trying may be made uſe of for the examen of mercurius dulcis, and divers other bodies, totally or partly diſſoluble in water, as of alum, which is often ſophiſticated with ſome baſer ſalt, and of Roman vitriol, which is ſometimes either counterfeited, or adulterated by the help of roch alum, and a tincture of copper. And according as the weight in oil of the body propoſed recedes more or leſs from the weight of the ſtandard, ſo the adulteration may be probably concluded to be leſſer or greater.

CHAP. XI.

BEFORE I go off from this ſubject, it is fit, that I give you notice, that the hydroſtaticks may ſupply us with another way of eſtimating the intenſive gravity of bodies, ſolid or fluid, that may on ſome occaſions be of good uſe. The way I mean is this; we take a ſolid body more than heavy enough to ſink in water, and carefully obſerve, once for all, its weight in the air; then we weigh the ſelf ſame ſolid, firſt in one of the liquors we would examine, and then in another; and ſo onwards, if there be more than two: and having noted the difference between the ſolid, and each of the liquors, it is eaſy to find, according to the practice elſewhere delivered, the ſpecifick weight of each, and the proportions betwixt them. And in regard it is but one and the ſame ſolid, that is compared to the differing liquors; whatſoever their number be, it will not be difficult to compare the ſpecifick gravities of thoſe liquors betwixt themſelves, and to diſcover, by the weight of the firſt, that of any of the others, that one pleaſes.

THE propoſed way having been but ſummarily delivered, it will not be amiſs to ſubjoin ſome remarks relating to it.

AND firſt, if you intend to employ but one ſolid in your examen of liquors, it will be neceſſary you make choice of ſuch an one, as hath a much greater ſpecifick gravity, than is neceſſary to make it ſink in water. For there are ſome liquors, that are far, perhaps twice, more ponderous than this newly named. Secondly, the body ought to be heavy enough to ſink in all liquors but quickſilver (for in that none but gold is ponderous enough to ſink.) But if your trials are to be made upon liquors, that belong to the vegetable or animal kingdom, the body you employ need not be near ſo ponderous; though it ought to be more ſo than water; becauſe (as I found by trials purpoſely made) ſome liquors, that are very ſpiritous and volatile, are yet much heavier in ſpecie than water. It is not very eaſy to pitch upon ſuch a ſingle ſolid, as may have all the qualities in reference to our purpoſes, that may be deſired in it, if it be to be made uſe of for a long time. For thirdly, beſides that, it ought not to loſe of its weight (and conſequently to change it) by the inſenſible avolation of effluvia, and that it muſt be, as was freſhly noted, of a conſiderable ſpecifick gravity. Fourthly, it ought not to be too big, or too intenſely heavy, leſt it be too heavy for a tender balance, or require too much liquor to environ it. Fifthly, it ought to be of ſuch a texture as not to be diſſolved, or corroded, by any of the ſeveral liquors, ſome of which may be ſharp and piercing menſtruums, that it is to be weighed in, and thoſe too of differing natures. Sixthly, it ſhould alſo be of ſuch a make, as is not eaſily liable to be broken, or otherwiſe ſpoiled, that it may laſt till all the deſigned experiments, though many, be made with it. Seventhly and laſtly, it is deſirable, that it ſhould be of a natural and uniform, as to ſenſe, and procurable ſubſtance; that the experiments made with it may be eaſily enough communicated to others, and, if they think fit, tried over again by them; and that, if any be judged worthy, they may be tranſmitted to poſterity.

SEVERAL bodies there are, that I looked upon as more fit than moſt others to be employed about the trials we are treating of. The chief of theſe were brimſtone, hard wax, ivory, and white marble. But though each of theſe, eſpecially if fitly ſhaped, may be of uſe on ſome particular occaſions; yet every one wanted ſome of the deſirable qualifications lately mentioned. And therefore, I made much more uſe of three other bodies, not becauſe they were ſuch as I could wiſh, but becauſe they were the leaſt remote from being ſuch, among thoſe I could procure. The firſt of theſe was a piece of amber between three and four drachms in weight, of an high yellow colour, but very tranſparent, and of an uniform texture and convenient ſhape. This was judged fit to be employed, when we were to examine the lighter ſorts of liquors, ſuch as common water, rain-water, *&c.* wine, brandy, rectified ſpirit of wine, vinegar, and the liquors drawn from it, cyder, beer, ale, urine, many waters and ſpirits diſtilled from bodies belonging to the vegetable and to the animal kingdoms. But it is not proper for the more ponderous kind of liquors, ſince it will not ſink to the bottom, but float at the top, not only of ſome liquors of the mineral kingdom (as will ere long appear) but in ſeveral liquors afforded

us by the ſaline parts of bodies belonging to the vegetable kingdom; as you will find within a few pages.

THE ſecond body I employed was a globular glaſs, which I cauſed to be blown at a lamp, and to be hermetically ſealed at the neck, which was purpoſely made very ſhort, after there had been lodged in it as much quickſilver, and no more, as we gueſſed would ſerve to ſink it in any liquor, except quickſilver. This, by reaſon of its great bulk, in reference to its weight, was fit to diſcover differences in weight minute enough between the liquors it was weighed in; and it was out of danger of being corroded, even by ſharp menſtruums; and therefore, on divers other occaſions, I preferred this inſtrument to any of the other two; but it is diſadvantaged by theſe inconveniencies, that it is difficult to be made, or procured; that it is hard to be preſerved, being very eaſy to be broken; and that partly on this account, and partly on others, it can ſcarce be a fit ſtandard in reference to ſuch obſervations, as are to be communicated to others, and tranſmitted to poſterity.

WHEREFORE for experiments, that are to be imparted and recorded, I made uſe of a ſolid, which, though heavier in ſpecie than was neceſſary to enable one to compare together the lighter ſorts of liquors, and to diſcover their minuter diſparities in point of weight, is yet a natural ſtandard, not ſubject to be broken without groſs negligence, nor to be diſſolved or corroded by the liquors it was to be immerſed in, however of various kinds, and very ſharp, and ponderous enough to ſink in all of them, except quickſilver, and yet not near ſo ponderous, as the lighteſt metals, or many metalline bodies. This ſolid I ſpeak of is rock-cryſtal, which I formerly repreſented, as for its purity, homogeneity, *&c.* fit to afford a meaſure, to which other bodies may be compared in weight, and by that means among themſelves. And of this pure concrete we employed an almoſt complete globe (weighing in the air ℥ii. ʒß. grains 3.) ſave that it had in one part of it two ſmall holes near one another, and eaſily ſtopt up with hard wax, after there had been put through them an horſe-hair, by whoſe means the ball was eaſily faſtened to the ſcale, from whence it was to hang in the water. The bigneſs of this globular body made it the more fit to diſcover the leſſer differences between liquors in point of intenſive gravity. But becauſe we may have oftentimes occaſion to know the weight of liquors, of which, by reaſon of their precioufneſs, or rarity, we can command but ſmall quantities, as it frequently happens, if we be to try the weight of chemical oils, tinctures, eſſences, *&c.* we thought fit, for ſuch liquors, to provide a piece of cryſtal, ſuch as nature had framed it, *viz.* an hexagonal priſm, with a kind of pyramid at the end, which is oppoſite to the extreme, at which it was broken off from the body it grew on. For this clear and finely ſhaped cryſtal (or what is very near of kin to it, white amethiſt) by reaſon of its oblong figure, might be commodiouſly weighed in ſo ſlender a cylindrical glaſs, as required but a ſmall quantity of liquor to cover and ſurround a conveniently ſhaped body, that weighed, in the air, but half an ounce and ſixteen grains. And to render the obſervations, made with theſe two bodies of medicinal and other liquors (for there are ſeveral of theſe trials, that belong not to this tract) the more uſeful to experimenters, I ſhall here deſire you to take notice, once for all, that the ball of cryſtal was to water of the ſame bulk, as $2\frac{57}{100}$ to 1, or thereabouts; and the priſmatical oblong piece of cryſtal was, to a quantity of the ſame liquor, equal to it in magnitude, as $2\frac{66}{100}$ to 1.

I HAVE the more particularly delivered the way of exploring the gravity of ſeveral liquors with one ſolid, becauſe there may be made of it a couple of applications, that may, on ſeveral occaſions, be of uſe, not only to chemiſts, phyſicians, and apothecaries, but to divers other experimenters, that are not of either of their profeſſions.

THESE applications do, I confeſs, belong to another paper (*viz.* an eſſay about ſome uſes of chemiſtry improved) that was written divers years ago. But ſince, by reaſon of the loſs of divers leaves of it, I know not whether, much leſs when, it will come abroad, I ſhall at preſent borrow ſome few things of it to accommodate my preſent deſign.

FIRST then, the piece of clear amber formerly mentioned, or ſome ſuch convenient body, that is not too little, nor *in ſpecie* too heavy, may ſerve the chemiſt, apothecary, and others, to make probable gueſſes of the degree of ſpirituoſity, or of thinneſs, that is to be found in many liquors belonging to the vegetable or the animal kingdom, which may be done with far leſs error by this way, than by thoſe uncertain ſigns, on which the common ways of gueſſing are wont to be grounded. For having once provided a liquor, by compariſon whereto one may ſafely make eſtimates of others of the ſame kind, or denomination, it will be eaſy, by obſerving the differing weights of the amber in ſeveral liquors to judge of the fineneſs of any of them in its kind; for, *cæteris paribus*, that is the thinneſt, or abounds moſt in ſpirituous parts, where the ſolid weighs more than in the other, as for inſtance, the amber we employed, that in water weighed $6\frac{1}{4}$ grains, in common red French wine weighed $8\frac{1}{2}$ grains, in common brandy of a pretty good ſort, ſuch as that of *Nantz*, $17\frac{1}{4}$ grains, and in vinous ſpirits highly rectified $34\frac{1}{8}$ grains. The ſame way one may employ, to judge of the ſtrength of ſpirits of vinegar, *acetum radicatum*, *&c.* but with a great difference in the application. For it may paſs for a general rule, that it is probable, that of liquors diſtilled from wine, cyder, ale, and other fermented liquors, the hydroſtatical body (if I may ſo call it) weighs more or leſs, according as the liquor it is weighed in is more or leſs ſpirituous; but, on the contrary, in acid ſpirits and liquors, the leſs the ſolid weighs, the ſtronger one may repute that liquor to be: that greater decrement of weight pro-

proceeding uſually from the greater proportion it contains of ſalts, that are not volatile.

I MUST not here pretermit one convenience of the way newly propoſed, that may, in tract of time, ſave you ſome money, and, at leaſt, will enable you to huſband better, than in the vulgar method you can, liquors, that you may have but ſmall quantities of, or that are worthy to be preſerved. For, you know, it is uſual with many chemiſts, and eſpecially thoſe, that are more circumſpect than others, to try the goodneſs of their ſpirit of wine, or brandy, or other ſpirits drawn from fermented liquors, by ſetting fire to a ſpoonful of the ſpirit to be examined, in order to ſee how much of it is totally inflammable, and how great, or little a portion of phlegm will be left behind. But, not here to mention the ſcruples I propoſe in another paper, about this way of trying ardent ſpirits, I ſhall now only take notice, that, by the newly recited way you loſe or ſpoil all that you try, and the better the ſpirit is, the greater is your loſs; whereas by the hydroſtatical way, the liquor is examined without being deſtroyed.

IT is now fit to add, that by the help of the foregoing obſervations, one may alſo make eſtimates of liquors of the ſame kind not diſtilled, whether fermented or not fermented, as ſeveral ſorts of beer, or of ale, or of cyder, or of juices of apples, or of pearls newly preſſed out. And the ſame hydroſtatical ſolid may be employed, to compare with one another in point of intenſive weight, liquors of differing kinds, as wine, beer, ale, mead, cyder, perry, verjuice, expreſſed oils, eſſential oils of different bodies, *&c.*

BUT, in caſe the liquors to be employed be very ponderous, amber will not be a fit ſolid to be examined about them; for I have found by trial, (what one would ſcarce ſuſpect) not only that it would ſwim or float in divers liquors made by ſolution of ſalts, whether in the moiſt air, or even in water, ſuch as oil of tartar per deliquium, ſolution of ſalt of tartar in as little water as may be, and ſolution of the ſalt of pot-aſhes, *&c.* But ſome diſtilled liquors would not ſuffer my pellucid amber to ſink to the bottom, as I found by trial made with oil of vitriol, with ſpirit of nitre, and even with good ſpirit of ſalt.

BESIDES, there may be another uſe made of our hydroſtatical ſolid, which may, on divers occaſions, be as ſerviceable to experiments in general, by aſſiſting them to proportion to their purpoſes, the ſtrength of the menſtruums, and other liquors they are to employ, as the former uſe is to diſtillers and apothecaries, for diſcovering the ſtrength of the already prepared liquors, that they would examine. For there are divers experiments, that either do not ſucceed, or at leaſt do not ſucceed ſo well, unleſs the menſtruums, or other liquors employed in making them, be of a determinate degree of ſtrength, (which is uſually knowable by a certain degree of intenſive weight.) This will be the more eaſily granted, if (as I have elſewhere ſhewn) the ſtrength and ſpirituoſity even of ſome liquors, whoſe chief virtue and uſe is to be good ſolvents, may yet be unfit to diſſolve, as well becauſe their ſtrength exceeds a certain meaſure, as becauſe by their weakneſs they fall ſhort of it. Of this, I remember, I gave an inſtance in aqua fortis, whoſe ſtrength, as its name intimates, is reckoned the beſt quality it can have; for I found, that if it were rectified ſo much as to make it as ſtrong as we could, or but ſomewhat leſs ſtrong than that, it would not diſſolve ſilver, but required to be weakened by an addition of water; and I found, that the menſtruum, though it were not much rectified, would not near ſo well diſſolve the filings or raſpings of crude lead, when it was moderately ſtrong and fit to diſſolve ſilver, as when it was allayed with a conſiderable quantity of water, eſpecially if afforded by rain, or by diſtillation. I ſhall add, that in making extractions from many vegetable ſubſtances for medicinal uſes, chemiſts themſelves may fall into a miſtake, when they affect to employ their moſt rectified ſpirit of wine, as the beſt menſtruum for their purpoſe: for the medicinal virtue of not a few ſuch bodies does not reſide only in what chemiſts call their ſulphur, and might perhaps more properly be called the reſinous part, which indeed is beſt diſſolved by ſuch ſpirit of wine as is carefully dephlegmed; but alſo in a more gummous, and partly perhaps almoſt mucilaginous ſubſtance, for whoſe extraction a moderately phlegmatick ſpirit is more proper, becauſe of the aqueous portion, that is mingled with the inflammable one; ſince we ſee, that ſome gummous bodies, as gum arabick, gum tragacanth, *&c.* are not diſpoſed to be diſſolved by the beſt rectified ſpirit of wine, as they are by aqueous liquors, as water, weak ſpirit of wine, *&c.* and ſome, though diſſoluble in both kinds of menſtruums, are yet leſs eaſily ſo in ſtrong ſpirit of wine, than in wateriſh menſtruums, as may be obſerved particularly in myrrh; for other inſtances applicable to theſe advertiſements belong to another paper.

AND what has been now ſaid may ſerve to perſuade you, that it may be of good uſe, on divers occaſions, to take notice of the degree of ſtrength of the menſtruum, or other liquor, we employ about this or that nice experiment; that when we have occaſion to reiterate it to the ſame purpoſe only, we may be able to bring the liquor we make uſe of to the ſame degree of ſtrength with that, which we formerly employed, and by which the deſigned effect was produced. But in experiments, that ſhould be very critically made, it will not be amiſs to bear in mind this caution, that if the liquor be very ponderous in ſpecie, as oil of vitriol, or oil of tartar per deliquium, it will be fit to put ſomething into the ſcale, from which the ſolid hangs, to make compenſation for that part of the hair, that is immerſed, ſince horſe-hair not being of the ſame ſpecifick gravity with this liquor, (though it be preſumed to be ſo with common water) is to be conſidered as a ſomewhat lighter body, capable of buoying up the ſolid a little,

a little, and therefore its comparative levity ſhould be compenſated.

CHAP. XII.

BESIDES the way we come from diſcourſing of, there is indeed another way, which we have, on divers occaſions, found uſeful to compare different liquors, that are of the ſame magnitude in point of weight. This is done by ſucceſſively filling a vial greater or ſmaller, furniſhed with a pretty long and ſlender cylindrical ſtem, to a certain ſtable mark made near the top, with the ſeveral liquors to be compared together in point of gravity.

BUT this way I muſt here do no more than name, not ſo much becauſe I ſpeak of it in a convenient place of another paper, as becauſe it is not hydroſtatical. But there is alſo another way to diſcover, whether or no two or more liquors propoſed differ in ſpecifick weight, and to make ſome not groundleſs eſtimate of their differences. This is done by a hollow cylinder of braſs, or other metal, made ſomewhat heavy at bottom to make it ſwim upright, that ſinks more or leſs in ſeveral liquors, as they are lighter or heavier, one than another. But the diligent *Merſennus* himſelf, who propoſes this way, confeſſes it to be very difficult to make ſure obſervations by it. To which I ſhall therefore add but this, that being a metal, it may be corroded by acid menſtruums; and if it be of braſs or copper it may be wrought upon or injured by urinous menſtruums too.

WHAT *Merſennus* ſaid of this inſtrument, may be applied to another, though differing from it both in ſhape and matter. For it is made of two glaſs bubbles, and a very ſlender ſtem, which is hermetically ſealed with a ballaſt in the lowermoſt of quickſilver to keep it ſteady, when partly immerſed in liquors, in which this inſtrument, like the metalline cylinder, ſinks deeper in lighter liquors, than in heavier, in a meaſure ſomewhat anſwerable to their differences in gravity. But, though I have, on ſeveral occaſions, employed theſe inſtruments, and found them not unuſeful, when I did not confine myſelf to one or two, but made uſe of ſeveral different ſizes, according to the various liquors I was to examine; yet what you may elſewhere find about this inſtrument, diſpenſes me from ſaying any more of it in this place, than that for ſome of the ends aimed at in this chapter, it is inferior to the way of examining liquors by the help of the balance.

THERE is alſo another way, that is hydroſtatical, propoſed by *Merſennus*, of weighing of liquors in water, and it is this: he bids you take a glaſs vial, to which being firſt weighed in air, and then in water, you are to adjuſt a ſtopple of wax, or cork, that will fit it exactly. This done, you are to fill the vial with the liquor you would examine, ſo that no air be left between it and the ſtopple. The veſſel thus filled you are to weigh in water, and ſubſtract from its weight there, the formerly noted weight of the glaſs itſelf in water, and alſo that of the ſtopple; which done, the remains will give the weight of the liquor propoſed in water. This method I lately chanced to find propounded by (the writer newly named) the induſtrious *Merſennus* in his *Hydraulicks*; but I remember not, that he affirms himſelf to have made uſe of it; and though it may be ſerviceable on ſome occaſions, yet I fear it will be troubleſom in practice. For (to omit ſome inconvenient circumſtances) ordinary vials, capable of containing a competent quantity of liquor, are uſually too heavy to be employed with tender balances; and common ſtopples (ſuch as *Merſennus* may be well ſuppoſed to have employed) will be ſubject to divers inconveniencies, as that they may be penetrated by ſome liquors, and corroded by others; and if they be made of cork, or of common wax, or any other ſubſtance lighter in ſpecie than water, it will not be eaſy to find its ſpecifick gravity, eſpecially ſince evaporation and other accidents make this itſelf vary; and whatever matter, vegetable or animal, it be made of, the veſſel will coſt you two operations, one to diſcover the weight of the veſſel in water, and the other that of the ſtopple, (at that time) which is troubleſom. Wherefore, when I met with this way in the ingenious *Merſennus*, it ſeemed to me more inconvenient than one, that I remember I had formerly thought of, and which I have ſometimes put in practice, by chuſing a vial not too large, and of a round figure, that being the moſt capacious under ſuch a ſuperficies, and inſtead of other ſtopples, fitting it with one of (the like) glaſs, carefully ground to the neck of it. For by this means the inconveniencies of a ſtopple lighter than water were avoided, nor would the ſtopple alter its ſpecifick gravity, either by imbibition, or evaporation; nor would it be penetrated by the moſt ſubtile ſpirits, nor corroded by the moſt fretting ones. To which may be added, becauſe in ſome caſes it may be conſiderable, that a glaſs ſtopple, as it will not be wrought on by the liquor contained in the vial, ſo it will not communicate any tincture, or extraneous quality, to the liquor; which cannot be affirmed of a ſtopple of cork or wax, in reference to ſome ſubtil and very corroſive, or otherwiſe very penetrating liquors: this hydroſtatical bottle (as for diſtinction ſake I call it) being together with its ſtopple carefully weighed, firſt in air, and then in water, (that the gravity of the whole inſtrument in that liquor may be ſettled once for all) we filled it exactly with the liquor to be examined, and ſo proceeded, as if we were to weigh quickſilver according to the manner formerly declared in the eighth chapter. The weight of the given liquor in water being thus obtained, its proportion in weight to water of the ſame bulk may be eaſily diſcovered by the way formerly delivered in the ſecond chapter (or the tenth chapter.) This way of examining liquors may, on ſomeo ccaſions, do good ſervice; and I did the rather now and then make uſe of it,

becauſe

becauſe it is applicable to all kind of liquors, whether heavier in ſpecie than water, or lighter.

If you lay aſide the ſtopple, the round ball itſelf may be made uſe of on ſeveral occaſions, inſtead of that hydroſtatical bucket formerly mentioned; for the weighing of quickſilver, and divers heavy powders, eſpecially if they be coarſe ones. But if the inſtrument be fitly ſhaped, and not too heavy, there may belong to it a greater conveniency than this. For when you have, and are willing to ſpare liquor enough to environ the little bottle, it may be uſefully ſubſtituted to the hydroſtatical bubble, with quickſilver encloſed, that I formerly recommended. For by reaſon of its exact ſtopple, it has no need of an hermetick ſeal, (which is not eaſy to be made or procured) and it is far leſs ſubject to be broken than a bubble. And yet that which I moſt made uſe of (and which weighed about ℥i. ʒiiiß. grains xix. or 709 grains) being well ſtopt with only air in it, would ſink by its own weight in water, and in liquors lighter than this, as wine, brandy, *&c.* And if it were to be employed in liquors much more ponderous than water, as aqua fortis, oil of tartar per deliquium, *&c.* it was eaſy to make it fit to be weighed in them alſo, by putting into it a quantity of quickſilver (or ſome other fit body) of a determinate weight, as two, three, or four drachms, before we ſtopped it: which ballaſt, when the operation is over, may, if it be quickſilver, be eaſily taken totally out, and kept apart for the like uſes: and the empty bottle and ſtopple may thereby become fit again, to be weighed in water and lighter liquors.

But notwithſtanding all this, becauſe glaſſes, for ſize, ſhape, and weight, fit for balances, tender enough, and furniſhed with glaſs ſtopples exactly fitted to them, are very difficult to procure; and the way itſelf is ſubject to ſome of the inconveniencies that we imputed to other ways, not long ſince mentioned: it ſeems, that generally ſpeaking, this way of finding the weight of liquors in water, is inferior for common uſe to thoſe more ſimple ones that we formerly recommended.

See the chapter.

CHAP. XIII.

Uſe VI. Having now laid down the method of weighing one liquor in another, it is allowable, and may be fit, that we ſubjoin ſome application of it; eſpecially becauſe it will become me to make good, in ſome meaſure, what I remember I formerly hinted to you, *viz.* that in the ſubſequent part of this paper, there would be delivered a further uſe, which may be counted the ſixth of the hydroſtaticks in examining medicinal bodies. And though by the inſtances we lately had occaſion to propoſe in ſome of the chapters preceding this, divers things referable to this uſe are ſet down already; yet I ſhould not content myſelf (as I now muſt do) to point at the chief heads or kinds of things referable to it, if on a ſubject that is more fertile than it ſeems, want of leiſure did not reſtrain me from deſcending to treat of the particular inſtances that belong to them.

Among the ſervices then that the hydroſtaticks may do a ſagacious phyſician, I muſt not omit one, though it has not hitherto, that I know of, been propounded by any author. And, I hope, you will not think it improper to be taken notice of here, though it do not regard only the materia medica, but is applicable (as I may elſewhere relate that I made it) to divers ſubjects that are referable to other parts of phyſiology: ſince divers bodies, that ſeem not ſo directly to regard the materia medica, as it is uſually repoſited in the ſhops of drugſters, have been in ſome times and places, and may deſervedly be now made to afford matter for remedies to a free and ingenious phyſician.

I consider then, that there are many liquors, whoſe ſpecifick gravity it may be uſeful to know, not only as it may help to diſtinguiſh genuine or well-conditioned ones from them that are not ſo, but for other good purpoſes too.

Instances of this kind may be afforded by the juices of herbs and fruits; where (according to the direction given in the laſt chapter) we firſt weigh a determinate quantity, as an ounce, or ſo many drachms in our hydroſtatical jar, or bucket; and putting ſome oil of turpentine on it, we ſink it warily into that liquor, whoſe ſpecifick gravity, in reference to refined ſilver, clear rock cryſtal, (or ſome other body, if we know it to be as pure) has been carefully found out and regiſtered: for by this means (as we have lately manifeſted) ſubſtituting this oil for common water, we may diſcover the ſpecifick gravity of liquors, not to be weighed in water, becauſe they mingle with it. And thus we may find, not only the difference in ponderoſity between the juices of plants of different kinds, as of wormwood and roſes, and ſometimes of the ſubordinate ſpecies of the ſame genius, as of abſynthium vulgare, ponticum, romanum, *&c.* and roſes, white, red, damaſk, yellow, *&c.* but we may on ſome occaſions obſerve, whether, and if at all, how far the keeping of a juice for ſome time, more or leſs, or the fermentation of it, or the putrefaction will alter its ſpecifick gravity. There are alſo other liquids uſed by phyſicians, and not ponderable in water, that may be by this way examined, as honey, vinegar, verjuice, *&c.* And by the ſame way may be alſo diſcovered and compared, the ſpecifick weight of the juices of fruits of different kinds, as of grapes, apples, pears, quinces, *&c.* and of ſubordinate ſpecies belonging to the ſame genus, as the newly expreſſed juices that make ſacks, French-wines, rheniſh-wines, *&c.* and thoſe liquors that are preſſed out of ſeveral ſorts of apples, as pippins, pearmains, John-apples, queen-apples, *&c.* And in divers of theſe, a perſon that is curious enough, may probably, by the method we have been propoſing, be enabled to take notice of the differences produced in

the ſpecifick gravity, (whoſe changes are uſually accompanied with thoſe of conſiſtence, *&c.*) in the ſeveral ſucceſſive ſtates, wherein the liquors may be found at different times, as (not to mention the juice of unripe grapes, *viz.* verjuice) the juice of ripe grapes is in very differing ſtates when it is newly preſſed out, when it begins to ferment, when it is yet but new wine, when it has attained its full maturity and perfection, when it begins to degenerate into ropy pricked wine, *&c.* and when it is abſolutely changed into vinegar, or elſe into vappa.

BUT here it ought not to be concealed from you, that in this kind of experiments, to make uſe ſucceſsfully of the hydroſtatical bucket, is a taſk difficult enough, for reaſons that a few trials will eaſily diſcover. And therefore, though I would not diſcourage the ſkilful, yet for thoſe that do not find themſelves dextrous at making experiments, I think it adviſable to employ, inſtead of the bucket, amber, or ſome other convenient hydroſtatical ſolid, or rather (which is better) a glaſs bottle and ſtopple, ſuch as we formerly deſcribed, but as large as may well be employed without overloading or injuring the balance.

CHAP. XIV.

AS I thought it was fit to give the foregoing advertiſement by way of caution in the caſes that occaſioned it; ſo having conſidered the nature and ſcope of the hydroſtatical experiments in general that belong to this eſſay, I ſhall venture to add for the encouragement of thoſe that are better furniſhed with inquiſitive minds, than with nice balances; that though in divers trials, eſpecially thoſe that are made about precious things, as gold, pearls, diamonds, and other gems, there is no relying upon any but very good and tender balances; yet, on many other occaſions, it is not neceſſary, though it be deſirable, that the ſcales we employ ſhould be extraordinary good. And this for two reaſons: firſt, becauſe many hydroſtatical experiments are ſuch, that a little variation from the exact proportion of the ſolid to the liquor, or between bodies of the ſame denomination, can lead us into no conſiderable error, or at leaſt not defeat the experimenter's main deſign; as with a balance that is not nice, one may ſufficiently diſtinguiſh between an human calculus and a pebble, or other ordinary ſtone, and between coarſe and fine, native cinnabar: and between a true guinea, or other piece of coined gold that is not very ſmall, and a counterfeit one of braſs, or any ſuch mixture, though never ſo finely gilt.

AND ſecondly, becauſe as there are few phyſical experiments, wherein mathematical preciſeneſs is neceſſary, and fewer wherein it is to be expected; ſo in many hydroſtatical trials, it is very probable, that the difference of bodies of the ſame kind, or denomination, flowing from their compoſitions and internal textures, will make a diſcernable, though but ſmall difference in their ſpecifick gravity: as in rock-cryſtal itſelf, we have found ſome pieces to be to water, as $2\frac{5}{100}$, or a little more to one; and others to be to the ſame liquor as two and ſix, or between ſix and ſeven tenths to one. And therefore, how exact ſoever the balance be, there muſt be ſome allowance made for the diverſity that may be found in the bodies themſelves that are examined, which diverſity may perhaps produce, at leaſt, as great difference in the proportions we ſeek for, as needs to be expected from a ſmall difference of tenderneſs in the balances we employ. And indeed, neither one of thoſe differences, nor the other, (nor perhaps both together) is wont to be ſo conſiderable, as to challenge much regard in phyſical experiments; or at leaſt, as to hinder it to be true, that on moſt occaſions, the hydroſtatical way of examining the ſpecifick weight of bodies, is preferable by far to any other way of doing it that as yet has been practiſed.

BEFORE I proceed to the remaining part of this eſſay, it will be worth while to obviate an objection, that I foreſee may be made by critical naturaliſts againſt the method hitherto delivered, of finding the proportion in weight betwixt a ſinking body, and water of the ſame bulk. For it ſpeciouſly may, and probably will be objected, that by this method we cannot diſcover the proportion between a ſolid body, and water in general, but only betwixt the propoſed body, and the particular water it is weighed in; becauſe there may be a great diſparity betwixt liquors that are called, and that deſervedly, common water. And ſome travellers tell us from the preſs, that the water of an eaſtern river, which if I miſtake not is *Ganges*, is by a fifth part lighter than our water.

BUT to this plauſible objection, I have two things to anſwer.

AND firſt, having had upon ſeveral occaſions the opportunity, as well as curioſity, to examine the weight of divers waters, ſome of them taken up in places very diſtant from one another, I found the difference between their ſpecifick gravities far leſs than almoſt any body would expect. And if I be not much deceived by my memory, (which I muſt have recourſe to, becauſe I have not by me the notes I took of thoſe trials) the difference between waters, where one would expect a notable diſparity, was but about the thouſandth part (and ſometimes perchance very far leſs) of the weight of either. Nor did I find any difference conſiderable in reference to our queſtion, between the weight of divers waters of different kinds, as ſpring-water, river-water, rain-water, and ſnow-water, though this laſt were ſomewhat lighter than any of the reſt. And having had the curioſity to procure ſome water brought into *England*, if I much miſremember not, from the river *Ganges* itſelf; I found it very little, if at all lighter than ſome of our common waters.

AND now I ſhall repreſent in the ſecond place, that I do not pretend, (and indeed it is not neceſſary) that the proportion, obtainable by

by our method, ſhould have a mathematical preciſeneſs. For in experiments where we are to deal with groſs matter, and to employ about it material inſtruments, it is ſufficient to have a phyſical, and almoſt impoſſible to obtain (unleſs ſometimes by accident) a mathematical exactneſs, as they will ſcarce deny, that have, as I have done, conſidered and made trial of the difficulties that oppoſe the attainment of ſuch a preciſeneſs.

CHAP. XV.

Hydroſtatical ſtereometry applied to the materia medica.

SECT. I.

THERE is an uſe of hydroſtaticks, which though it do not directly tend to the examen of drugs, or ſimples received into the materia medica, yet may be ſerviceable both to the phyſician and the naturaliſts, in delivering their deſcriptions; and ſo it may indirectly conduce to the knowledge of them, and help, on ſome occaſions, to diſtinguiſh between genuine ſimples (eſpecially fruits) and thoſe that are not ſo; it is known, that the writers of the materia medica are wont to ſet down the bigneſs of the bodies they deſcribe by very uncertain gueſſes; and thoſe that to be more accurate, aſſign them determinate meaſures, are wont to do it, by ſaying, that ſuch a fruit, or other body, is, for example, an inch, or two inches, or half a foot long; and half an inch, or a whole inch, or two inches and an half in breadth. But it is obvious to thoſe, that are not great ſtrangers to the mathematicks, that according to this way of deſcribing bodies, there may be, by reaſon of the great variety of figures, eſpecially irregular ones, they are capable of a very great diſparity of magnitude, or bulk in bodies, to each of which the ſame length and breadth may belong or be applied.

I SHOULD here be able to preſent you an hydroſtatical way of determining the bulk of bodies, both much nearer the truth than that newly recited, and grounded as well on experiments as mathematicks; if among other papers, I had not unfortunately loſt one, that I wrote many years ago, about the meaſuring of ſolids, by the help of liquors. But though I cannot, out of my memory, recover the theoretical part of that writing, (whoſe loſs I regret, becauſe it had been examined by one of the exacteſt, as well as famouſeſt mathematicians of our age, whom I invited to be preſent at the chief experiments) yet I think I can call to mind as much of the practical applications of it, as may ſuffice for my preſent purpoſe.

THE ground of the way I am about to propoſe to you, will be eaſily underſtood by the following, though but ſhort account. I cauſed to be carefully made by ſkilful artificers ſeveral cubes, both of different ſizes and different materials, as marble and metal; whoſe ſides were each of them, as near as the artiſt could make them, either an exact inch, or preciſely more inches than one, according to our *Engliſh* meaſure, which is ſaid to differ very little from the correſpondent one of the old Romans. Theſe cubes were carefully weighed in truſty balances: firſt, in the air, and then in common water. And though I found ſome little (and but little) difference, between the products of the trials; yet that difference being no more than might reaſonably be expected from the ſcarce avoidable imperfection, even of good artiſts, and their tools; we concluded, that one might, without any conſiderable error, take a medium (as they ſpeak) between theſe products, and allow even to this medium, a latitude of ſome grains; ſince that latitude will not amount to the ſixtieth part of the weight of a cubical inch of water. Since therefore ſome of our trials inclined us to judge, that about two hundred and ſixty; and ſome others to think, that about two hundred fifty two; and others again, that about two hundred fifty ſix came neareſt to the true weight of a cubical inch of water; we thought ourſelves at liberty to make uſe of that number, that ſhould appear moſt commodious for practice, by reaſon of its diviſions and ſubdiviſions into aliquot parts, eſpecially if the body to be examined were not great; ſince in that caſe, two or three grains, more or leſs, would not be conſiderable, eſpecially in a phyſicial experiment, where geometrical exactneſs is not to be expected nor indeed required, and a far leſs accurate eſtimate will be leſs unaccurate, than can with any certainty be made by the formerly mentioned way of judging by the length, breadth, and depth (or thickneſs) of the body propoſed.

I MADE the leſs ſcruple to pitch upon the laſt of the three forementioned numbers of grains, not only becauſe it affords many aliquot parts for a number that is no greater, ſince barely by a ſucceſſive bipartition it affords ſeven ſuch parts, *viz.* 128. 64. 32. 16. 8. 4. and 2. but becauſe I was encouraged by an experiment differing from thoſe already mentioned. For having cauſed to be purpoſely made by a good artiſt, an hollow cube of braſs, whoſe cavity was fitted to contain a juſt cubical inch of matter, (either ſolid or liquid) we put it into one ſcale of a tender balance, with a juſt counterpoiſe in the other, and placed it there as horizontally as we could. Then we warily put into it, little by little, as much common water as it would contain, without either overflowing, or having its ſurface manifeſtly turgid; putting alſo from time to time in the oppoſite ſcale, ſmall weights to keep it from ſwerving too much at once from an æquilibrium. And though it is extremely difficult in practice, to diſcern with certainty, when the veſſel is ſo exactly filled, that a drop, or even two, or three drops, more or leſs, cannot be added, or taken away, without being obſervable by the eye; yet for this very reaſon, we thought our experiment agreeable enough to our ſuppoſition, when we found, that by ſo light an alteration, the weight of the water, when the ſcales were

heedfully counterpoiſed, amounted to near about two hundred fifty ſix grains, which number we ſhall therefore hereafter employ, as expreſſing the weight of a cubical inch of water.

AND now to apply the paſt diſcourſe to our preſent purpoſe.

SUPPOSE, for example, that a ſolid heavier in ſpecie than water, having been weighed firſt in the air, be found to loſe of its weight in the water ℥ß. ſixteen grains, that is, two hundred fifty ſix grains, I ſay, that the dimenſions of this ſolid, if it were of a cubical ſhape, would make it equal to a cubical inch: ſo that (to expreſs the thing yet more clearly) if the given body be ſuppoſed to be an eaſily fuſible metal, as tin, or lead; and being melted to be warily poured into the hollow cube formerly mentioned, and ſuffered to cool, it would juſt fill it and no more, and conſequently be a cube of metal, whoſe length, breadth, and depth, are equal to one another, and each of them to an inch. For as it is a fundamental theorem in hydroſtaticks, demonſtrated mathematically by *Archimedes*, and elſewhere phyſically by me; that *a ſinking ſolid weighs leſs in water than in air, by the weight of as much water as is equal to the ſolid in bulk*; and ſince we have lately ſhewn by experiments, that a cubical inch of water weighs ℥ß. 16 grains, that is, 256 grains; it will follow, that when the decrement of a body's weight in water is found to be 256 grains, the ſolid content of that body is a cubical inch: ſince an aqueous body weighing 256 grains is equal in magnitude, as well to the ſolid propounded, as to a cubick inch of water. And here it may prevent a ſcruple, to obſerve, that to make bodies equal in magnitude, it is not at all neceſſary, that they ſhould be of the ſame weight, or of the ſame matter, as is evident in bullets of copper, tin, and gold, caſt ſeparately and dextrouſly in the ſame mould. For though they be equal in bulk, yet the bullet of copper will be much heavier than that of tin; and the bullet of pure gold will be more than twice as heavy as that of copper. Whenſoever therefore you meet with a ſolid, ponderous enough to ſink in water, that being weighed in that liquor loſes 256 grains of the weight it had in the air; you may conclude, the magnitude or bulk of that body to be equal to a cubical inch, of whatever matter it conſiſts, or of what ſhape ſoever, regular or irregular it be. And in caſe the ſolid propoſed do (as it will very often happen) loſe of its weight in the water leſs than 256 grains, you may conclude its bulk to be proportionably leſs than a cubical inch. And ſuch is the conveniency of the number we have pitched upon, which abounds in aliquot parts; that every 32 grains that the ſolid loſes of its weight in the water, anſwers to an eighth (that is, half a quarter) of an inch in the bulk of the body: as if the decrement be 128 grains, the ſolid will be half a cubick inch; and if it be but 64 grains, it will be but a quarter of a cubick inch; and ſo if it be 160 grains, it will be $\frac{5}{8}$, that is, half and half a quarter of an inch cube: and on the other ſide, if the decrement of the given body exceed the ſtandard, *viz.* 256 grains, twice, thrice, *&c.* then that decrement being reduced to grains, as ſuppoſe it weigh ℥i. + grains 32 (amounting to 512 grains) or ℥i. ß. + grains 48 (amounting to 768 grains) the body will be equal to two or three (ſingle) cubical inches. And, if after the diviſion there remains a fraction, it will not be difficult to eſtimate it to him that conſiders what has been newly delivered.

SECT. II.

TO diſcover hydroſtatically the ſolid contents of a body heavier in ſpecie than water; to him that knows how to make uſe of the method newly delivered, it will not be very difficult. But to meaſure, by the help of water, the ſolidity of a body lighter in ſpecie than that liquor, is a work not ſo eaſily performed. It may ſomewhat leſſen the difficulty, to premiſe, that there are two ſorts of bodies, that will naturally not ſink in water. For ſome are of a cloſer texture, and will not be eaſily invaded by that liquor; at leaſt, in ſo ſhort a time, as they are of neceſſity to be kept in it: and others abound with pores, that diſpoſe them to imbibe the water they muſt be kept immerſed in till the experiment be diſpatched.

To begin with the firſt ſort of bodies: it is known to hydroſtaticians, that, according to a theorem of *Archimedes*, the weight of a body belonging to that kind, may be gathered from the weight of the water, that is equal in magnitude to that part of the body that is immerſed in that liquor, when the ſolid floats freely upon it; as, if a paralelipipedon, or a cylinder, of wood, twelve inches long, being placed upon water, ſhould reſt there, when a twelfth part of it lies beneath the ſurface of the liquor; in this caſe, the weight of the water, equal in bulk to that immerſed twelfth part, would be equal to the weight of the whole wooden body. But becauſe the bodies, whoſe bulk phyſicians and chemiſts may have occaſion to examine, will very ſeldom happen to have ſhapes ſo near thoſe of regular ones; it will ſcarce be worth our while to enlarge upon this way of eſtimating light bodies; which it will be ſo troubleſom to make fit for moſt mens practice, that, unleſs it be deſired, I ſhall not trouble you with it; but forthwith proceed to what will conduce far more to our preſent deſign, which being to meaſure the ſolid contents of bodies, not ſo heavy (intenſively) as water, and for the moſt part irregularly ſhaped; it will be neceſſary, that we employ a method differing from what we have hitherto made uſe of. In the firſt ſtep of this, though not in the ſecond, we may be helped by the induſtrious *Merſennus*, who probably borrowed his way of *Ghetaldus*, from whoſe *promotus Archimedes* he profeſſedly borrows many things.

BUT becauſe that, on this occaſion, *Merſennus*, affecting brevity, hath made himſelf obſcure; ſo that what he writes can ſcarce be underſtood, but by mathematical peruſers; I

ſhall, for the ſake of another ſort of readers, deliver the propounded method, though not in ſo few words, yet more clearly and orderly. Firſt then, you ſhall weigh in the air the body (lighter than water) to be examined. Secondly, you ſhall take a plate of lead capable of making this body ſink with itſelf in water, and of ſome weight, not incumbred with fractions, as juſt a dram, half an ounce, an ounce, *&c.* Thirdly, you muſt weigh this plate in water, and by ſubſtracting its weight in this liquor from what it weighed in the air, you muſt obtain a difference, which will give the weight of as much water as is equal in bulk to the immerſed lead. This, for diſtinction's ſake, may be called the ſpecifick weight of the lead in water. Fourthly, you muſt tie together (which you may beſt do by one or more horſe-hairs) the plate of lead, and the lighter body, and note the weight of the aggregate, which, as you know, is nothing but the ſum of the reſpective weights of the lighter, and of the heavier body. Fifthly, you muſt weigh this aggregate in the water, and ſubſtract its weight in that liquor, from the weight that the ſame aggregate had in the air, and the difference will be the ſpecifick weight of the ſaid aggregate in water. Sixthly, from this difference ſubſtract the formerly found ſpecifick weight of the plate alone in water, and the remains will give you the weight of the lighter body in the ſame liquor.

THUS far our author; without whoſe help we may eaſily diſpatch the reſt of our work. by the method employed already of meaſuring ſolids heavier than water. For the lately obtained weight of the light body in water, being (according to the method formerly propoſed) divided by 256 grains, will give you the ſolid content of that naturally floating body.

BUT becauſe a method, that is difficult enough to be put in practice by thoſe that are not more than ordinarily well verſed in hydroſtaticks, requires to be illuſtrated by an example, I ſhall ſubjoin an experiment, that may ſerve not only to clear up this practice, but in good meaſure to confirm it too; we took then a piece of oak conveniently ſhaped, and that weighed in air 193½ grains. To this we tied with an horſe-hair a plate of lead, weighing juſt half an ounce, *i. e.* 240 grains. But before we tied them together, the lead was weighed in water, where it loſt of its former weight 20 grains, which, being deducted out of the 240 grains lately mentioned, left a difference or reſidue of 20 grains, for the ſpecifick weight of this piece of lead (for I have ſeldom found lead quite ſo heavy) in the water. Then the aggregate of the wood and lead was weighed, firſt in the air, and found to be 433 grains and an half, and then in water, where it amounted but to 162 grains; which being ſubſtracted from the aggregate of the ſame bodies in the air, the reſidue, or difference, was found to be 271 and ½ grains: from which difference the other difference of 20 grains (which had been lately found) of the leaden plate alone in the water being deducted, there remained 251 grains and ½ for the weight of water equal in bulk to the given piece of wood. If this number had amounted to 256 grains, of which it fell ſhort but 4½ grains, we might have concluded the ſolidity of it to be a cubick inch, ſince 256 grains of water, which we formerly found equal to a bulk of water of a cubick inch, was alſo now found equal to the bulk of the given piece of wood. And indeed, intending (as I formerly intimated) to give an example, that ſhould not only illuſtrate, but confirm the propoſed practice, I cauſed the wood I employed to be formed into as exact a cube of an inch every way as I could procure from a joiner, that bragged of the pains he had taken about it: ſo that the difference of its weight in water from 256 grains, the weight of a full cubic inch of that liquor, may probably be imputed to ſome little imperfection in the figure of the wood, or ſome other light circumſtance, not conſiderable enough to be much regarded.

Of this experiment one of my notes gives the following account.

I. THE oaken cube in air weighs (ʒiii. grains xiii½.)	193½
II. THE weight of the lead in air, (ʒiv.)	240
III. THE weight of the lead in water (ʒiiiß. grains x.)	220
Which, being ſubſtracted from its weight in air, leaves for its ſpecifick weight in water	020
IV. THE aggregate of the two in air is	433½
V. THE weight of both together in water is	162
Which being ſubſtracted from its weight in air, gives the difference of both the aggregates	271½
VI. THE difference between the weight of lead alone in air and in water, or, which is all one, the ſpecific weight of the plate alone, *viz.*	20
being ſubſtracted from the difference of the weights of the aggregates in air, and in water, gives [for the weight of the cube propoſed]	251½

THE way of meaſuring bodies, that has been hitherto delivered, is appropriated to ſuch as will not at all, or, at leaſt, will not readily be diſſolved in water. But becauſe there are divers other ſolids, as lumps of ſalt, alum, vitriol, ſugar, *&c.* whoſe magnitudes it may be fit for inquiſitive men, of more profeſſions than one, to know and to compare, I ſhall, to what has been already ſaid, ſubjoin this advertiſement; that the ſame way may be applied to meaſure the magnitudes of ſolids diſſoluble in water, if, inſtead of this liquor, we ſubſtitute oil of turpentine, whoſe proportion and ſpecifick gravity to water we have found, or is otherwiſe known to us. When I firſt made this reflection I had not ſuch conveniencies, as when I found the weight of a cubick inch of water, to determine the weight of a cubick inch of oil of turpentine. But, having

having yet lying by me the hollow veſſel of braſs, whoſe cavity was an exact inch, that I employed to find out the weight of a cubick inch of water, I made uſe of it on this occaſion too; and found, that when it was carefully filled with ſuch oil of turpentine as we were wont to employ about hydroſtatical experiments, the contained liquor amounted but to 221 grains, and an eighth (part of a grain) by which number the difference of the weight of a ſolid in the air, and in that oil, being divided, the quotient will give you the ſolid contents of the examined body.

AFTER ſo circumſtantial an account as we have given of the way of hydroſtatically examining ſuch floating ſolids as, like the wood we employed, are of a texture at leaſt moderately cloſe, it may be ſeaſonable, to proceed to the mention of the ſecond ſort of floating bodies, that I formerly told you might be propoſed to be weighed in water; namely, ſuch as, by their poroſity or laxneſs of texture, are ſubject to embibe too much of that liquor, even in as little time as is neceſſary for the diſpatch of the experiment.

MERSENNUS * (more briefly than clearly) propoſes an expedient in this caſe, which is, to cover over the body to be weighed in water with wax, pitch, or ſome other gluten, as he calls it, whoſe ſpecifick weight in water muſt be firſt known. But I take bees-wax to be much preferable to the other two. For pitch is ſo apt to ſtick to one's hands or clothes, that it is troubleſome to apply it, and very difficult to get it off: and as for glues, moſt of them, eſpecially the more common, are diſſoluble in water, and therefore not ſo fit for the purpoſe as bees-wax (for that, I preſume, he means by wax) which has this conveniency in it, that its proportion to water being uſually conſtant enough, and the gravity of thoſe two bodies differing but little, one may more eaſily diſpatch a good part of the experiment; which is thus to be performed. Take the ſolid lighter than water, that you would examine hydroſtatically, and having weighed it in the air, over-lay it carefully with a thin coat of bees-wax, ſo that no part of it may remain uncovered, or acceſſible to the liquor. Then take alſo in the air the weight of the wax you have employed, and faſten to the body thus coated, a plate of lead, or tin, heavy enough to make it ſink, and obſerve the weight of the aggregate in water. This done, ſubſtract the weight of as much water as is equal in bulk to the wax, and proceed with the reſt, as is before taught. *Merſennus* declares this practice by this inſtance, if the wax that inveſts the propoſed body be of ℥xxii. in the air, the bulk of water equal to it will be ℥xxi. and therefore a quantity of water of ℥xxi. muſt be firſt taken away, or ſubſtracted, that the remaining bulk, equal to the (immerſed) body, may, by its gravity, ſhew the gravity of the body (propoſed) as has before been ſaid.

BUT becauſe the way above delivered can can help us but to the knowledge of the weight of the propoſed body in water, we muſt, to diſcover the ſolid content of it, proceed further than our *Merſennus* enables us to go; and therefore we muſt divide the weight of the ſolid in water, already found, by 256 grains, that by the help of the quotient we may obtain the ſolid contents of the propoſed body.

I HAVE ſometimes (to add that upon the by) thought of, and tried, another expedient, to hinder ſmaller ſolids, whether lighter or heavier in ſpecie than water, from imbibing the ambient liquor. In order to this, I firſt found the weight of a cubick inch of quickſilver (which is not difficult to diſcover by its proportion to water of the ſame bulk.) And then we brought the body to be meaſured into a veſſel, whoſe ſolid contents were known before: and thirdly, all that was not poſſeſſed by the firm body being filled with quickſilver, it was eaſy enough to know, by the difference in weight of that quickſilver from the weight of the quickſilver requiſite to fill the whole veſſel, to how much quickſilver the environed body was equal. And by this means, and the knowledge before gained of the weight of a cubical inch of mercury, the ſolid contents of the body propoſed was not difficult to be obtained. But I forbear to give more than this intimation of an expedient, which, beſides that it belongs properly to another eſſay, is rather mechanical than hydroſtatical. And, for the ſame reaſon, I forbear to ſet down one way of meaſuring the contents of irregular ſolids, delivered in ſome books of practical geometry; and another, but yet unpubliſhed, way, differing enough from the former, that tends to the ſame purpoſe.

CHAP. XVI.

BUT, I perceive, that it is now more than time, that I ſhould put an end to a labour, that has, I fear, tired you, becauſe I am ſure it has tired me. And yet I dare not conclude this tract without briefly anſwering a couple of queſtions, that, I foreſee, may juſtly enough be aſked me by a peruſer of the foregoing eſſay.

AND firſt, I preſume it may be demanded, 'Whether I have propoſed the beſt ways that 'can be thought of to examine bodies hydro-'ſtatically?' To which queſtion I anſwer, that, upon divers conſiderations, ſome of which have been mentioned here and there in the body of the foregoing eſſay, I did not think my ſelf obliged ſolicitouſly to invent or propound new inſtruments for the hydroſtatical examen of bodies. For though I am not ignorant, that divers more curious and artificial ways of finding out their weight in water, or their ſolid contents by it, may be deviſed by perſons more ſkilful and ſagacious than I: And though alſo I think it not unlikely, that, when the utility of ſuch practices comes to be taken notice of, artificial inſtruments will be found out to facilitate, or otherwiſe improve them; yet I thought it became me at firſt to propound only the more ſimple ways of operating, as the moſt likely to invite the gene-

* In his *Phænomena Hydraulica*, pag. 185.

rality of thoſe, for whoſe ſake this eſſay is made publick, and to require, for the main part of our experiments, only the uſe of the balance, as an inſtrument eaſily procurable, and already, for other purpoſes, in moſt mens hands, without mentioning, at this time, any more artificial inſtruments; though ſome of them are ſuch as I have long ſince not only had thoughts of, but for my own uſes practiſed; which intimation may be countenanced, if it were needful, by the mention of that little inſtrument, for diſtinguiſhing between true and counterfeit guineas, or the like pieces of coined gold, by the help of water; which was ſeveral years ago publiſhed in the philoſophical tranſactions, and has ſince (without ſtaying for my improvements of it) been made uſe of by ſome, and uſurped by others. But of ſuch things no more in this place.

HAVING anſwered the firſt queſtion, it remains that I conſider the ſecond, wherein, though I ſhall aim at brevity as much as in the former, yet I fear I ſhall not be able to diſcuſs it in as few lines as I did that. I preſume then it will be aſked, 'What credit may 'be given to the eſtimates of the weight, and 'proportions of bodies, obtained by hydro-'ſtatical trials?' Since we ſee that though mathematicians, not knowing, or not applying, our obſervation about the ſpecifick gravity of rock-cryſtal, and the nature of oil, eſpecially that of turpentine, have given us but the proportions of metals, and ſome very few other familiar bodies, as the loadſtone, wax, honey, oil and wine; yet thoſe few that have not tranſcribed from one another differ, in the tables they have left us of the comparative weight of thoſe few bodies.

THIS queſtion is ſo comprehenſive, that I think it cannot well receive a ſingle anſwer; and therefore I ſhall offer two things to be conſidered about it.

AND firſt, I freely acknowledge, that there is no exact uniformity in the obſervations delivered about the weight of metals, and the other bodies newly named, among the few authors that have written of this ſubject; and there would probably have been yet more difference in their accounts, if ſome, even of thoſe writers, had not avowedly made uſe, to their purpoſes, of as much as they thought fit of the tables of *Ghetaldus*.

NAY, I ſhall not think it very ſtrange, if I find that the experiments of the ſame man, made at diſtant times, and in other differing circumſtances, ſhould not all of them exactly agree. For I have already noted, and I think in more places than one, that there will ſcarce be found ſo great an uniformity in qualities, and particularly in ſpecifick weight, among bodies of the ſame kind or denomination, as there is generally preſumed to be. There may be alſo ſome difference, though but little, betwixt the waters men employ, eſpecially if the air be at one time (as in July) intenſely hot, and at another (as in *January*) exceeding cold. The difference alſo of degrees of goodneſs of the balances, men employ about nice experiments, is not altogether inconſiderable. But there is a thing of greater moment than this towards the hindering hydroſtatical experiments, and even ſtatical ones themſelves, from being ſo accurate as thoſe that are not verſed in ſuch matters may require. The thing I mean is the difficulty of finding an exact uniformity in weights of the ſame denomination, which, for that reaſon, are vulgarly ſuppoſed to be exactly equal; but to know how far this ſuppoſition is to be relied on, it may at preſent ſuffice to ſet down ſome paſſages of a mathematician juſtly famous for his diligence, and who has made it his particular work to examine theſe matters ſcrupulouſly. The firſt paſſage I ſhall alledge out of his writings ſhall be the ſhort account he gives of many trials he made of natural grains, whence all ſorts of weights have been deduced. * *Cum* (ſaith he) *omnia grana, vel ſemina, quæ reperiri ſolent in atriis venalibus Lutetiæ, ad ſtateram expendiſſem, vixque granum ullum inter ejuſdem ſpeciei grana grano alteri exactè reſpondiſſet, in incertis ludere nolui.* The ſame author informs us, that the Roman grains differ from the French grains, ſince, as he obſerves, 688 grains of the former ſort are equiponderant but to 576 grains of the latter ſort. And he ſubjoins, that whilſt he was writing theſe things there was found by the more exact weights of the mint, an error in the former eſtimate of at leaſt half a grain in 36 grains.

AND elſewhere he † gives notice, that, by two relations ſent him from *Rome*, about the number of grains contained in a Roman ounce, it appeared, that even that number varied, ſince one of thoſe relations reckoned 612 grains in an ounce, whereas the other allowed it but 576 grains. And yet this I do not wonder at, becauſe I have my ſelf found it ſo difficult in practice to get and keep weights (for, as little as this is wont to be ſuſpected, the very air may, in time, a little alter them) as exact as I deſired, that I left off the hopes of it. And one remark, though commonly overlooked, I think too conſiderable to be here omitted. For whereas the accurate *Ghetaldus*'s ‖ tables of the weight of metals, and ſome few other bodies, in reference to one another, are looked upon as the moſt authentick that have been publiſhed, and are accordingly made the moſt uſe of: it is certain, that the weights he employed are not divided, as ours are. For though indeed according to him, as well as with us, the ounce conſiſts of four and twenty ſcruples, yet the ſcruple, which with us is divided but into twenty grains, he divides into twenty four. But to return to *Merſennus*, a while after he had told us of the difference between his repeated trials, and thoſe of other men, in determining the weight of a certain body, he has this paſſage, which ſhews, that he was not over confident of the preciſeneſs of all his own determinations. *Cum autem* (ſaith he)

* *In præfatione ad librum de menſuris, ponderibus & nummis.*
† *Merſennus*, in the paper entituled, *Pariſienſia pondera*, Corollar. 1, and 2.
‖ In the paper called *Galic. Nummis.*

pag. 37. lib. 16. *dixi, Chelinum, undecim dici denariorum, credunt tamen alii decem duntaxat, nil aſſero.*

HAVING gone through the firſt part of my anſwer, to the ſecond query above propoſed, it remains, that I proceed to the other part, which perhaps will not need more than the following reflection.

I CONSIDER then, that though it be granted, that hydroſtatical experiments are not always either ſingly accurate, or exactly agreeable among themſelves, yet they may well be both accurate enough to be of very good uſe, eſpecially in practice, and leſs remote from being quite accurate, than any other ways that have been hitherto known to be practiſed of determining the proportions of bodies in point of weight and bulk, and of meaſuring the ſolid contents of ſtable bodies, whether heavier in ſpecie than water, or lighter.

THE firſt part of this reflection may be deduced as a corollary from, or at leaſt confirmed by the greateſt part of the foregoing eſſay. And indeed, as little ſkill as I have in hydroſtaticks, I would not be debarred from the uſe of them for a conſiderable ſum of money; it having already done me acceptable ſervice, and on far more occaſions than I myſelf at firſt expected, eſpecially in the examen of metals and mineral bodies, and of ſeveral chemical productions. And I have been able more than once or twice to undeceive artiſts and other experimenters, that *bona fide*, believed they had made, or were poſſeſſors of, *luna fixa*, (as they call it) and other valuable things: and to make a good judgment of the genuineneſs or falſity, and the degrees of worth, or ſtrength in their kind, of divers richer or poorer metalline mixtures, and other bodies, (ſome ſolid, and ſome liquid) whoſe fair appearances might otherwiſe have much puzzled, if not deceived me.

BUT of this more may be found in another paper. For I muſt haſten to the ſecond part of our deſigned reflection, by repreſenting, that our hydroſtatical methods of diſcovering the weights and bulks of bodies, though they may be not mathematically accurate, yet they are leſs remote from being ſo, than any way of menſuration of bodies, (eſpecially ſuch little ones as we uſually have need to examine on the account of the materia medica) by the geometrical inſtruments, that are hitherto known to be practiſed; or, by the way, whereby the *tabula coitionis & expanſionis materiæ per ſpatia in tangibilibus*, &c. was framed by the renowned Sir * *Francis Bacon*, whoſe judicious reflections upon the rarity and denſity of bodies, ſuch as their meaſures are delivered in that table, do ſufficiently manifeſt, as the philoſophical genius of the author, ſo the utility that may be derived from even ſuch determinations of the bulks and weights of bodies, as fall ſhort enough of being accurate.

I MIGHT here relate, that to convince ſome curious perſons, how much hydroſtaticks may be made ſerviceable to as accurate a menſuration, as ought to be expected in phyſical experiments; I deſired a virtuoſo, firſt, to put together two lumps of metal, (*viz.* of tin, and of lead) in a certain proportion, that he was to conceal from me, but to ſet down in writing to prevent miſtakes. Then I deſired him to melt the metals (whoſe reſpective ſpecifick gravities I knew before) into one maſs, and give me that maſs. And thirdly, I weighed it carefully in water, and did alſo algebraically examine it. Which being done, I told him, that the lead he had employed, amounted to ſuch a weight, and the tin to ſuch another; which being compared with the quantities he had committed to paper, the difference was found to be little more than one grain, and this itſelf probably proceeded from ſome ſcarce avoidable imperfection in the melting, pouring out, *&c.* of the given bodies. But becauſe ſpecious arithmetick was employed in this work, (to which yet it was not abſolutely neceſſary) I ſhall lay no ſtreſs upon it; becauſe, if I miſtake not, the paſt diſcourſe may ſuffice to give the hydroſtatical ways of menſuration of bodies a preference to their competitors, and may keep it from being preſumptuous, to ſay, that they may be received as the beſt for practice, till ſome other more accurate, and yet as firmly grounded, and as practicable ways of accompliſhing the ſame purpoſes, ſhall be propoſed.

* *Verulam in hiſtoriâ denſi & rari, p. m.* 8. *&c.*

A PRE-

A PREVIOUS

HYDROSTATICAL WAY

OF

Eſtimating ORES.

Addreſſed to the Secretary of the Royal Society.

ADVERTISEMENTS.

I KNOW there is a greater number of different kinds of foſſils, than thoſe that are yet known to belong to the materia medica. And, I confeſs, that the perſons, which the following paper is chiefly deſigned to aſſiſt, are thoſe that explore minerals with an aim not at health, but at profit. But yet I was content, that the enſuing diſcourſe ſhould accompany the foregoing eſſay, as a kind of appendix to it, becauſe many of the ſubjects, about which both tracts are converſant, are the ſame; and the fundamental obſervation, (*viz.* about the ſpecifick gravity of cryſtal or marble) and the hydroſtatical way of applying it in explorations, is the ſame in both: and alſo (and indeed chiefly) becauſe I was made to believe, that it might, eſpecially at this ſeaſon, be grateful, and not unuſeful to divers ſearchers after profitable minerals.

THIS paper (as the inſcription intimates) was deſigned to be ſent to the learned ſecretary of the Royal Society, when it was expected, that he would begin again to publiſh monthly the philoſophical tranſactions, that had been long ſuſpended, and as long deſired by the curious. But ſince ſome accidents have occurred, that occaſion a further delay of their publication, it was not thought fit, this paper (after having been long already) ſhould be any longer confined to my cloſet. It is true, that this diſcourſe, containing but an application of an hydroſtatical experiment, I am far, as I ought to be, from propoſing it as a treatiſe of the docimaſtical art, whoſe grand inſtrument is, the fire ſkilfully managed. For which reaſon I have forborn to ſet down in this paper, any of the flux powders, or other ways of examining ores, or of reducing them, or other foſſils, to metals or regulus's; that either ſay-maſters are wont to employ, or I have deviſed, or tried upon minerals. But this notwithſtanding our unpractiſed way of eſtimating ores, may not be uſeleſs; and for that reaſon, will not perhaps be unwelcome to ſome that love mineralogy, much better than they underſtand it: eſpecially coming forth at a time, when many induſtrious perſons of this nation are excited to look after profitable minerals, by the repeal (that has been made ſince our appendix was written) of a diſcouraging act of parliament made in the reign of *Henry* IV. And though our hydroſtatical way of eſtimating foſſils will not determine how rich or poor they are in this or that particular metal; yet (as is intimated at the beginning in the enſuing paper) it may, on many occaſions, ſerve to keep thoſe that are venturous, and not ſkilful, from being deluded by cheats, or from deluding themſelves with ill-grounded expectations, which the promiſing appearances of divers foſſils, eſpecially marchaſites, will temptingly invite, but never anſwer.

SECT. I.

SIR,

A way propoſed for the previous examen of ores.

AT a time wherein ſo many ingenious or induſtrious men appear very ſolicitous to diſcover and to work mines, both here and in *New England*, and others of his majeſty's American colonies; it will not probably be thought unſeaſonable, nor prove unwelcome to the ſeekers of ſubterraneal treaſures, if my deſire to do them a piece of ſervice, make me borrow of a paper, I long ſince wrote about ſome things relating to the materia medica, a few paragraphs that contain a way of exploration of minerals; which though it reaches but to one of their qualities, will perhaps, by reaſon of the conſiderableneſs of this, keep on certain occaſion ſome ſearchers after mines from beginning chargeable works, or proſecuting them with too great expectations, which are uſually followed by proportionable diſappointments. And I make the leſs ſcruple to ſuffer this fragment to leave its company, and preſent itſelf to you; becauſe after

after the misfortune, I have formerly ſignified to you of the loſs and ſpoiling of ſeveral of my writings, I know not when, if ever, I may have opportunity of communicating to my friends the treatiſe that theſe paragraphs belong to.

THAT part of the forementioned treatiſe that concerns my preſent purpoſe, is founded on an experiment, whereof what you are about to read is one of the applications.

I SHALL then ſuccinctly inform you, that the obſervation, whereon my diſcourſe was grounded, is double, as will by and by appear; and that the riſe of it, which will help to underſtand the nature and influences of it, was this. I thought fit (for reaſons elſewhere given) to find out what was the ſpecifick gravity of a pure ſtone, ſuch as I ſuppoſed cryſtal or white marble, or a ſtony iſicle to be; and found it by the hydroſtatical way of trial, (doubtleſs not unknown to you) that is delivered in the eſſay called *Medicina Hydroſtatica*, whereof when you pleaſe, you may command a ſight, to have to clear common water, equal to it in bulk or magnitude, pretty near the ratio, or proportion of two and an half to one; or which is ſomewhat more obvious to conceive, as five to two; I ſaid pretty near, becauſe it is not always exact, nor need be for our preſent purpoſe, but uſually enough does ſomewhat rather exceed that proportion than fall ſhort of it; but that is ſo little, that it may, on all common occaſions, be ſafely enough neglected by a mineraliſt: though, if one pleaſes, one may make uſe of the proportion of $2\frac{1}{4}$ to 1, that is, of 11 to 4.

SECT. II.

THE uſes that may be made to our preſent purpoſe of this fundamental obſervation, are either of a more general or of a more particular nature.

As to the firſt of theſe, when my intention is only to diſcover in general, whether a foſſil propounded, or perhaps caſually lighted on, may with probability be judged to contain any ſubſtance, either metalline, or belonging to ſome foſſil of affinity to a metalline nature; and alſo, whether in caſe the firſt queſtion be reſolved in the affirmative, the propoſed boby does, indefinitely ſpeaking, contain much, or but little of the metalline or other adventitious ſubſtance: when I ſay, I would only make thoſe general inquiries, I weigh the body I would examine, firſt in air, and then in water, and obſerve the proportion in ſpecifick gravity between them; and if I find it weigh either leſs, or but little more than cryſtal or marble of the ſame bulk, I judge it unlikely to contain any metalline portion, conſiderable for its quantity. And if it weigh manifeſtly, or ſomewhat conſiderably more than marble or cryſtal, I gueſs, that in proportion to that exceſs, it abounds, more or leſs, with a metalline ingredient, or one or other of affinity to a metalline nature.

To explain myſelf a little by two or three examples; it is known, that the magnet is vulgarly reckoned amongſt ſtones, and its great hardneſs confirms men in that opinion. But having obſerved, that loadſtones, eſpecially thoſe that come from ſome places, that I elſewhere take notice of, ſeem to be apparently more ponderous than common ſtones of the like bulk; we weighed them in air and water, and found their ſpecifick gravity, eſpecially of ſome of them, ſo far to exceed that of cryſtal or marble, that it could not be difficult for us to conclude, that theſe foſſils contained a not inconſiderable proportion of metalline matter, which, by collateral experiments, delivered in another paper *, appeared to be of a martial or ferruginous nature.

EMERI is a foſſil well known to many tradeſmen, eſpecially armourers and gunſmiths, by whom it is commonly reputed a mere ſtone. But finding that its weight in water conſiderably exceeded that of cryſtal of the ſame bulk, ſince it was to that liquor very near as 4 to 1; I conjectured, that it contained a metalline ſubſtance, as afterwards by proper trials I found it to do. Upon the ſame ground (its weight in my hand) I concluded, that lapis hæmatites, that is commonly ſold in ſhops, and as its name witneſſeth, paſſes for a ſtone, did not ſparingly participate of a metalline ingredient; in proſecution of which conjecture, I quickly thought on ways whereby I diſcovered, that iron or ſteel was the metal it contained.

AND not to accumulate inſtances in this place, I ſhall advertiſe you in general, (what perhaps may hereafter be found uſeful to ſeveral enquirers) that upon the grounds hitherto mentioned, I was invited to gueſs, that divers bodies that were little ſuſpected to be of a metalline or mineral nature, did really contain a portion of ſubſtance that was ſo. And I remember in particular, that having met with granates of ſeveral ſizes, that were not Bohemian, but were found in other parts of Europe, and ſome that I diſcovered in a kind of talc, that was brought me from America; which angularly figured ſtones, I ſuſpected by their weight to be metallick, and found by hydroſtaticks, to have a ſpecifick gravity conſiderably ſurpaſſing that of cryſtal. Upon theſe grounds, I ſay, I ſuppoſed them to participate, and that not very ſparingly, of a metal, one or more; and by other ways of exploring, found that I had gueſſed aright; ſince I was able, notwithſtanding the great compactneſs of ſuch ſeemingly vitreous bodies, to diſcover there a decompoſition, and extract thence a metallick ſubſtance.

To theſe I might add other foſſils, and ſome that were not, even by men not unſkilful, ſuſpected to have any metallick ingredients. But I have not time to ſpeak of them, and therefore ſhall proceed in the lately begun diſcourſe.

* The author means a paper containing experiments and obſervations about the loadſtone, as it is a mineral.

SECT.

SECT. III.

TO illuſtrate then the general obſervation formerly laid down, and make it more diſtinct, I ſhall ſubjoin the following remarks.

FIRST, I do not pretend by this way to make any more than probable conjectures and eſtimates about the contents of the bodies, I examine by it: But though the eſtimates grounded on it be not always true, yet they may be frequently uſeful, as may be gathered from ſome of the ſubſequent obſervations.

SECONDLY, if the foſſil propoſed be lighter, eſpecially if it be much lighter than ſo much cryſtal, it is an almoſt certain token, that it is not a metalline ore. And this negative uſe, if I may ſo call it of our hydroſtaticks, may be more ſafely relied on, than the affirmative conſequences uſually can be. Thus when I find that jet, though a foſſil dug up in veins, eſpecially in the Pyrenean mountains, (as a learned man, whoſe brother has there a mine of jet, aſſured me) has far leſs of ſpecifick gravity than cryſtal, I conclude it to be no metalline body. The like inference I make on the ſame ground, as to foſſil amber or ſuccinum, ſulphur vive, and the obſervation holds in common ſulphur, (clear or ſemidiaphanous) Engliſh talc, Venetian talc, and ſome other firm concretions, whether brittle or not, that are dug out of the earth. Among theſe, I think fit to mention particularly black lead, leſt the name it bears ſhould deceive men into a belief, that it is an ore of that metal. For having found its weight, in reference to water, to be but as $1\frac{86}{100}$ to 1. And gathering from the ſmalneſs of its ſpecifick gravity, that it would prove to be very unlike our true common lead ores, I found, upon trial purpoſely made, that it was a mineral *ſui generis*, and ſeemed, upon the ſcore of more than one quality, to be of kin to a ſort of talc that I have met with.

THIRDLY, we ſhould diſtinguiſh between the ſeveral uſes that foſſils may be ſought for and examined by men of different profeſſions, or deſigns. And therefore, if a foſſil be found to be ſomewhat, and yet but very little heavier in ſpecie than cryſtal or marble, it may poſſibly have a metalline or mineral portion, which, though very ſmall in quantity, may conſiſt of ſuch efficacious parts, as may make it deſerve the eſteem of a jeweller, a phyſician, or a chemiſt. But if the ſurplus of ſpecifick gravity be inconſiderable, the foſſil it ſelf will be ſo too to a mineraliſt, that ſeeks not to gratify his curioſity, or make a good medicine, but to fill his purſe. For the charge and trouble of working a foſſil, ſo poor in metalline ſubſtance, will probably either exceed the profit, or keep it from being conſiderable; whereas if the ſpecifick gravity do much exceed that of marble or cryſtal, it may give good hopes of proving a ſubject profitable to be wrought on.

FOURTHLY, but here I muſt give notice, that though for the moſt part the great ponderoſity of a foſſil proceeds from a portion of ſome metalline ſubſtance, more ſtrictly ſo called, that is embodied with the other part of the concrete; yet this alone is indeed a certain ſign, that the foſſil is not a mere ſtone, but is not alone a ſure ſign, that the mineral portion is properly metalline; and therefore, where there is juſt cauſe of doubt, it is beſt to endeavour by ſome collateral ſigns to reſolve it. The reaſon why I thought fit to give you this admonition, is, that beſides metalline ores more properly ſo called, there are other foſſils, which ſome call ſemi-metals, others media mineralia, and others again give other appellations to; which foſſils, though of affinity to metals, are wont to be diſtinguiſhed from true metalline ores; ſuch (foſſils) as are (that I may here name the principal of them) antimony, biſmuth (uſually in our ſhops called tin-glaſs) lapis calaminaris, and pyrites, commonly called marcaſites, and vulgarly, in Engliſh, vitriol ſtones.) But there will not perhaps occur many caſes, wherein it will be neceſſary to have recourſe to collateral ſigns, to diſcern whether the mineral portion of a foſſil be, in a ſtricter ſenſe, of a metalline nature, or not: For theſe ſemi-metals that I ſpeak of are moſt commonly found either in veins, or in maſſes, or great lumps of their reſpective kinds; and eaſily diſcover, to one that conſiders them with ſo much as a moderate meaſure of attention and ſkill, what ſpecies of foſſils they belong to. I have indeed from *Devonſhire* received a lump of matter, which the owner of the mine, not knowing what to make of, deſired my opinion of, wherein I found ſome antimony mixt with lead, which was the predominant body. But ſuch mixtures occur not often enough, at leaſt here in *England*, to keep our way of eſtimating ponderous foſſils from being, on moſt occaſions, uſeful.

SECT. IV.

FIFTHLY, it will be almoſt neceſſary to give you notice in this place, that there may be a two-fold eſtimate made of the ſpecifick gravity of ores; one, when the metalline body propoſed is weighed in its natural ſtate, that is, as it is taken out of the earth, accompanied with the ſpar, or other heterogeneous matter, that firmly adheres to it, (only the looſe earth being firſt waſhed off:) and the other, after it has been beaten ſmall and ſeparated from ſtony and other heterogeneous ſubſtances, by the help of water; where being ſkilfully agitated, there is eaſily diſcovered a notable diſparity in weight between theſe and the genuine or metalline parts of the ore, which being thus ſevered from the reſt, are called, for inſtance, waſhed tin, if afforded by a vein of that metal. And ſometimes alſo it is very uſeful, if not neceſſary, to prepare the ore by roaſting it, (as they ſpeak) once, or oftner, or by keeping it ſeveral hours in a competently ſtrong fire, as is uſually enough done to prepare copper ore, eſpecially if it be ſtubborn. I have diſtinctly mentioned theſe two ſtates, wherein the weight of an ore may be eſtimated; becauſe I have

I have obſerved, that in ſeveral caſes it will much import the experimenter to diſtinguiſh them carefully. For ſeveral ores, which in their natural ſtate, have too little of ſpecifick gravity to make them judged worth the charge of being wrought, may yet, being prepared by water and fire, afford a metalline portion ſo heavy in ſpecie, that it may give fair hopes of containing in it ſome portion of ſilver, or of gold; and in that caſe a ſmall proportion of the former, and a much ſmaller of the latter, would render the ore conſiderable, and make it pretty rich, though not in reference to the quantity it yields of the predominant metal, as lead, tin, or copper; yet in a more abſolute ſenſe, as it may better recompenſe the charges of him that ſhall work it. Which brings into my mind, that ſome time ago a piece of lead ore, then brought out of *Ireland*, being offered me to judge of, found it ſo light in the lump, that I thought it not at all worthy to be wrought for lead; but afterwards upon trial it appeared to be, though very poor in that metal, yet ſo well ſtored with corpuſcles of ſilver, that I ſcrupled not to encourage the owner to beſtow pains and coſt upon it.

SECT. V.

BUT there is one kind of minerals, that I have obſerved to impoſe on men ſo often, that I think it neceſſary to take a particular notice of them in this place. For, not to mention examples, that I might draw out of the books of travellers and navigators, I have met with, I know not how many, that have built great hopes, and ſome (which is worſe that have been at charges upon thoſe illuſory expectations of great matters from marcaſites. And, I remember, I have had ſent me, or brought me, not only from places nearer home, but from hotter and colder countries of the *Indies* themſelves, foſſils, whereof I was earneſtly deſired to give my opinion, that I found to be but marcaſites: and many of theſe foſſils having two qualities, that make them very fit to delude the vulgar and the unſkilful, namely, firſt a multitude of ſhining ſtreaks, or other gliſtering parts uſually of a colour near enough to that of gold, and ſometimes to that of ſilver; and then, a ponderouſneſs uſually not inferior, at leaſt to that of true metalline ores; marcaſites, I ſay, being thus fitted to delude the unſkilful, I have had much ado to undeceive ſome, that brought or ſent me them from *America*, of the pleaſing confidence they had entertained, that theſe promiſing foſſils were lumps of rich ore of gold, or ſilver. Wherefore ſince their ponderouſneſs (which is the criterion of minerals I am now treating of) is one of the two chief things that delude ſo many, I think it expedient to ſubjoin ſome few but various inſtances of the ſpecifick gravity of marcaſites, whereby it may appear, that ſome of them are, bulk for bulk, far more ponderous than divers true metalline ores, that I have tried, have been found to be. And indeed this great ponderoſity has ſeveral times invited me, before I made any artificial trial of propounded foſſils, and ſometimes before I took them out of the bags or papers to look on them, to judge, though perhaps to the ſurprize of thoſe that brought them, that they were not true ores, but marcaſites. And, becauſe this miſtake is ſpeciouſly grounded, and has deceived many, whereof ſome have undertaken voyages betwixt *Europe* and the *Indies*, upon confidence of the value of theſe gliſtering ſtones; I ſhall decline a little the method of this paper, which confines me to the hydroſtatical way of exploring minerals, to advertiſe thoſe whom it may concern, that they may eaſily try almoſt any ſtone, that by its great weight and luſtre they ſuſpect to be a marcaſite, if they put it either within a crucible or without one, into a well kindled fire, and blow now and then upon it with a pair of bellows. For by this means the ſulphur, wherewith marcaſites are wont to abound, (ſo that I remember, that even by diſtillation in a cloſe veſſel, I had ℥iv. of good brimſtone, like the vulgar, out of ℔iij. of the ſtones) will take fire, and burn with a flame for the moſt part blue like that of common ſulphur. And, if when it ceaſes to flame and ſmoke, you take it out of the fire and let it cool, you will find it deprived of all the gaudy appearance of rich metal it had before, and turned to a brittle blackiſh ſubſtance, differing enough from that of a metalline ore, more ſtrictly ſo called. Theſe laſt words I add, becauſe in a lax ſenſe, it is eaſy to ſhew, that marcaſites, at leaſt thoſe that I have tried, may be looked upon as a kind of metalline bodies. For beſides that I have found divers of them to contain particles of copper, I found all that I purpoſely examined, to contain, and ſome of them plentifully enough, corpuſcles of iron or ſteel, as plainly appeared, when, after the newly mentioned calcination (for with crude marcaſites I found not the following trial to ſucceed) I applied to the pulveriſed remains a vigorous load-ſtone; to which great multitudes of martial corpuſcles quickly adhered. And, I remember, I found in a catalogue of the foſſils of *Miſnia*, publiſhed by the experienced *Kentmannus*, that under the head or title of pyrites, he brings in ſeveral marcaſites, whereof ſome contained copper, others ſilver, others gold, and others both the laſt named metals; which brings into my mind, that having preſented, among other Engliſh minerals, a curiouſly ſhaped and very fine marcaſite, to a virtuoſo, that is now overſeer of one of the emperor's beſt mines; he quickly examined it by a peculiar way not known to me, hoping to find in it ſome gold or ſilver; but inſtead of that, obtained a portion of running mercury, which he was pleaſed to preſent me, and which I preſume I may have yet by me.

THOUGH I thought it needful to give the foregoing caution about marcaſites, for the reaſons before expreſſed, yet my deſign is only to keep the leſs ſkilful from being deluded by their promiſing appearance. For

otherwiſe I do not deny, but that it is poſſible for a ſkilful artiſt to make (at leaſt of ſome ſorts) of them a gainful uſe, either by fixing the volatile gold or ſilver, that may be found in ſome of them; or by graduating ſilver by their means; or perhaps by ſome other ways that I can but gueſs at. But (to add that on this occaſion) that, for which I much more value marcaſites, is, that (NB) ſomewhat more than bare conjectures make me think, that being dexterouſly handled, and perhaps even without additions, they may afford very noble, as well as uncommon medicines, and particularly in continual fevers, though their operation be uſually ſcarce ſenſible, but by their good effects.

SECT. VI.

ON this occaſion I muſt not forbear to give an advertiſement, that may be of good uſe to divers examiners of ores, eſpecially ſuch as are novices in the art of reducing them. And it is this, that as to many who make trials of ores, though they much value their own flux-powders, or thoſe that are cried up by others, yet they commonly act as if they expected nothing from thoſe that they prefer, but that they ſhould more than others facilitate the fuſion of the ores; as that which being once done, the metalline part will be ſeparated by its own weight, or as it were ſpontaneouſly. But yet having purpoſely examined the matter more nicely, and compared the quantities of metal, that we obtained from two portions of equal weight of the ſame ore, we found that thoſe proportions did very conſiderably differ, though that which yielded leaſt metal was fluxed down with a fondant (as the French compendiouſly call, what our men, after the Germans, call a flux-powder) that is dear enough, and not undeſervedly eſteemed, when ſuch ores are to be handled. And I little doubt, but that from other metalline ores, a greater portion of pure metal may be obtained by ſome, but little employed or known, fondants, and perhaps cheap ones too, than by others that are much more in uſe and famous; of which I may elſewhere give ſome inſtances: now, one that firſt occurs to my memory, was afforded me, by two equally heavy portions of the ſame lead ore devoid of ſpar; whereof one, being reduced with a due weight of nitre and tartar fulminated together, afforded much leſs of malleable lead, than was obtained by means of half or a quarter of the quantity of filings of *Mars*, which, for trial's ſake, I then employed on the other; to ſhew, how much better a reductive of that kind of ore that metalline flux was, than even a ſharp and fiery fixed ſalt.

AND yet (to give you an inſtance in a much more precious mineral than lead ore) I ſhall add, that having, for curioſity's ſake, tried ſome ounces of good native cinnabar finely pulveriſed, one half with a fixed alcali of tartar, and the other with a different flux-powder, we obtained from the firſt parcel twice as much mercury as we did from the other half, diſtilled with another fixed alcali, even though it were of a mineral nature.

ECT. VII.

Some obſervations about native gold.

About the hydroſtatical examen of gold and its ore.

GOLD being by far the moſt noble and precious of metals, it may be ill taken, if I ſhould here leave the ore and mineral, that affords it, altogether unmentioned; and therefore, though I have but two or three obſervations pertinent to my preſent ſubject, to offer about it, yet I think it may not be uſeleſs to ſay ſomewhat of that ore in this place.

I KNOW there are many learned men, and even chemiſts, that think there are no ſuch things as gold mines, properly ſo called. And I confeſs, that I myſelf was long kept from being confident of the affirmative. And I was induced to this diffidence by conſidering, that though having had the honour for divers years to be a member of his majeſty's council for foreign plantations, I had the opportunity to converſe with a conſiderable number of navigators, and other great travellers, and with divers perſons that had ſettled themſelves in the *Indies*, I made it more than once my buſineſs to enquire, not whether they knew of any golden mines in the popular ſenſe of the word, for I knew that there are in *Hungary*, *Macedonia*, and ſome other countries, mines that afford gold enough to deſerve to be wrought for it: but whether there are any real mines, or veins, whereof gold is manifeſtly the predominant metal. Having, I ſay, propoſed to many this queſtion, I was anſwered, that ſome of them indeed had heard of ſuch mines, but none of them had ever ſeen any. But afterwards I ſaw ſome ore that I judged true, that was preſented to his majeſty *Charles* II. and I alſo received from an unknown virtuoſo, reſiding in the *Eaſt Indies*, together with a very civil letter (which I wiſhed had been more hiſtorical and leſs complimental) among other leſs valuable pieces of ore, one in whoſe clefts, and a little beyond them, there appear ſome lumps, wherein by their colour, and other ſigns, it is ſo apparent, that gold is the predominant metal, that I little doubt, but that, if I would ſpoil the lump by breaking the ſpar, I ſhould find theſe metalline protuberances malleable, without the help of the fire.

BUT being unwilling to deſtroy the entireneſs of it, I ſhall make only a few and ſhort remarks about this ore.

THE biggeſt piece, and that which was beſt furniſhed with metalline parts, being about an ounce and a quarter in weight, contained ſo great a proportion of ſpar, in reference to the metal, that its weight to an equal bulk of water was but as $2\frac{91}{100}$ to 1.

BUT ſomewhat to compenſate this ſmalneſs of the metalline portion, that, that was of it, ſeemed to be all gold, there being no ſign of any other metal in that lump of ore,

nor in ſome leſſer ones that I received with it.

THE ſpar (as our mine men uſe to call that ſtony matter, in which the true ore is immediately lodged) did not look like the ſpar of lead ore, or that of any other of our Engliſh metals that I have ſeen, but ſeemed at firſt view to be a kind of white marble with a daſh of yellow.

AND upon trial, I found it to differ more from the ſpar of lead ore, which, with us, is uſually white, and almoſt ſemidiaphanous than in the colour. For, whereas our ſpar of lead ore is oftentimes ſo ſoft or tender, that it may eaſily enough be cut with a knife, we found the ſparry portion of our gold ore to be a ſolid ſtone, and that ſo hard, that being ſtruck with a piece of ſteel, it would yield ſparks of fire.

WHEREAS alſo I found, that the ſpar of lead ore would be eaſily enough, and in a ſhort-time (as about a quarter of an hour) calcined to a kind of lime; our golden ſpar, though kept ſome hours red hot in a crucible, did not appear to be at all calcined. And whereas I had formerly obſerved, that I could eaſily diſſolve the ſpar of lead ore in ſome acid menſtruums, and even in diſtilled vinegar itſelf, I did not find, that our golden ſpar, though kept divers hours in ſtronger menſtruums, as ſpirit of ſalt, aqua fortis, and aqua regis, was diſſolved or manifeſtly wrought upon by any of them, as if it were of a glaſſy nature, as well as of a very hard one.

A PIECE of ſpar, that had ſcarce any gold at all that could be diſcerned, being hydroſtatically examined, was in ſpecifick gravity to water as $2\frac{65}{100}$ to 1. which ponderoſity does but very little exceed that of white marble, or that of ſome good ſpar of lead ore that was compared with it.

IF I had received a greater quantity of gold ore, I ſhould have given a leſs imperfect account of this ſubject. But theſe notes, ſuch as they are, may perchance not be unwelcome to ſome of thoſe many Engliſh and other ſearchers for mines, that have never ſeen true gold ore, or have not had liberty to make any trials upon it, and yet are in ſearch of gold mines, eſpecially in *Jamaica*, where, if I much miſremember not, the * inquiſitive gentleman that conquered it for the Engliſh, told me, at his return thence, that the Spaniſh governor of the iſland, when his priſoner, confeſſed to him, that there was mineral gold, though the Spaniards did not dig deep for it for want of workmen.

* General *Venables.*

SECT. VIII.

BUT by the mention I have made of the true ore of gold, I would not diſcourage any from ſeeking for that rich metal in the veins of ſome other metals; becauſe, in divers of theſe, I know it may ſometimes be found blended with predominant minerals. This may appear by thoſe Hungarian copper mines of *Cremnitz*, whence a conſiderable quantity of gold is yearly obtained. I have elſewhere alſo taken notice, that I have ſeen an Engliſh tin ore, part of which I preſented to the king, wherein there lay, in little cells, a good number of ſmall leaves or chips of gold, which I ſaw there with pleaſure. And though the tin-men, not being able to ſeparate them with profit, uſually melted both the metals together, and ſold the product for mere tin; yet an experienced gentleman, who was owner of the mine, aſſured me, that one of his workmen, who had many little children, employed them with good profit, to pick the gold with their ſmall fingers out of the ſkilfully broken ore. And though lead mines be looked upon as thoſe, which the matter whereof gold is made is ſeldomeſt found to be near, and does as it were avoid; yet there is a place in *Scotland*, (whoſe name I remember not) where over a lead mine, upon or near the ſurface of the ground, they oftentimes find grains or bigger pieces of native gold without ſpar; ſome of which, by the ingenious owner's favour, I was maſter of, and thought ſometimes worthy of being preſented to that curious examiner of ores, his highneſs prince *Rupert*. And ſtill I have one bit of native metal by me, which, if much I miſtake not, I had from the ſame place: which foſſil, though I found it hydroſtatically (becauſe being native I would not melt it) not to be, as the owner ſuppoſed, pure gold; yet gold is the predominant metal in it, and the piece weighs forty odd grains. Memoirs for the natural hiſtory of tin.

SINCE I wrote the laſt foregoing lines, I have, in an old collection of my notes, found three, whereof the firſt is thus ſet down, a grain of Scotch gold, ſuch as nature had made it, without any adhering ſtone or ſpar, weighed ʒiij. + 21 grains: the ſecond thus, another grain of the ſame gold, that had here and there ſome little ſtone or ſpar ſticking to it, and partly incloſed in it, weighed ʒiij. + 3 grains; ſo that the heterogeneous ſubſtance being, according to my eſtimate, abated, it weighed about ʒiij: and the third is ſubjoined in theſe terms, a grain of Scotch gold weighed in air 43 grains, in water $39\frac{1}{2}$ grains, differ. $3 + \frac{1}{2}$ propor. $12\frac{7}{8}$ to 1.

THIS lightneſs of a yellow metal (heavier than braſs or ſilver) deſerves a reflection; but I cannot ſtay to make it.

IT ſeveral times happens, that among the leſſer grains of gold, that are more properly called ſand-gold, there are found pieces, ſome of which I have ſeen, that are ſingly big enough to be tied about with an horſe-hair, and ſo weighed in water, as lumps of ore of other metals are wont to be. And to ſuch bigger fragments of gold, it is manifeſt, by what has been already delivered, that our hydroſtatical way of exploring may be uſefully applied. For ſince, according to the famous and diligent *Merſennus*, and ſome eſteemed writers, pure gold is to water of the ſame bulk, as (about) 18 to 1; and by my examen of very fine gold, I found that it equals about nineteen times the weight of as much water (I ſay about, becauſe I unhappily loſt the exacteſt

acteſt of my trials upon gold among thoſe made upon the other metals in a moſt exquiſite balance) as is equal to it in bulk; it will readily appear, whether the fragment propoſed be perfectly pure or not. For if its weight amount to near nineteen times as much water in quantity, we may conclude it to be unallayed; and as it wants leſs or more of this ponderoſity, we may conclude it to be more or leſs pure.

SECT. IX.

IT is known, that ſince we began effectually to cultivate the African trade, it frequently brings into theſe parts, beſides things of leſs value, conſiderable quantities of what, from the moſt uſual ſize of it, is by many called ſand-gold; but which, by reaſon of the very unequal bulks of the grains, may perhaps juſtly be called fragments of gold, ſince being brought from the maritime parts, where no mines of gold are yet found, they ſeem to have been broken off and waſhed away from hidden veins by the violence of waters, that having carried them as far as they were able, left them a prey to men. Now (becauſe that unleſs it be perhaps brought by, or for ſome virtuoſo) there is ſcarce any gold that comes into *Europe* in lumps, under the form of ore; but a great deal that is brought from *Guinea*, (and thoſe other parts of *Africk*, which for that reaſon are compriſed under the name of the golden coaſt) in the form chiefly of ſand or gravel, groſſer or ſmaller, and partly alſo of leſs minute pieces; it may conduce to the ſcope of theſe papers to take notice, that in making eſtimates of the genuineneſs and the degrees of purity of theſe native fragments of gold, our hydroſtatical way of exploring may be of no ſmall uſe.

FOR firſt, when we have once diſcovered the proportion between pure or exquiſitely refined gold, and water equal to it in bulk, (which proportion I have lately given exactly enough for our preſent purpoſe) it is eaſy, by our hydroſtatical method, to examine the fineneſs of any other gold propoſed; ſo at leaſt as to know, whether it be perfectly fine; and if it be not, whether it do conſiderably fall ſhort of perfect fineneſs. But ſince of this I elſewhere treat, I think it more proper to obſerve in this place, that when once a man has found the true ſpecifick gravity of a parcel of ſand-gold, (ſmaller or coarſer) whoſe degree of fineneſs he knows by collateral trials, or ſome other means, (whatever they be) he may (as was formerly noted when I ſpoke of metalline ores) take this ſpecifick gravity for a ſtandard, with relation to which he may make his eſtimates of the fineneſs of other parcels of the like native gold, that he is concerned to buy or to examine. And, by this means, he may oftentimes prevent that chief fraud of the negroes, whereof ſeveral traders to the golden coaſt are not a little apprehenſive, as being in danger to be much damnified by it. For they complain, that though the blacks be, otherwiſe, for the moſt part, but a dull ſort of people; yet they have often made a ſhift to cheat the traders, by clandeſtinely mixing with the right ſand-gold, filings of copper, or rather of braſs, whoſe colour does ſo reſemble that of gold, that the fraud is not eaſily diſcerned. And in the account of a late voyage, made by the French to the coaſt of *Africk*, to trade eſpecially for gold, it is acknowledged, that the officers were egregiouſly cheated by the blacks, who, inſtead of paying them for the wares they brought with powder of true gold, gave them powder of braſs, or gilt copper, which thoſe that were not accuſtomed to make trial of ſuch wares, are, as the relater complains, in a ſcarce evitable danger to be cheated, as theſe Frenchmen confeſs they were in one day to the worth of a thouſand crowns. But in regard that, as trial has informed me, braſs is not quite half ſo heavy as fine gold of the ſame bulk, if there be any conſiderable quantity of filings of braſs with the gold; this mixture being put into ſuch an hydroſtatical bucket, or wide mouthed glaſs, as is mentioned in the eſſay, will manifeſtly weigh leſs in water, than if it were all gold. And by comparing its ſpecifick gravity, with that formerly found to the grain gold pitched upon for a ſtandard, the greater or leſſer decrement of the ſuſpected gold will help to make an eſtimate of the quantity of braſs, mingled with the natural gold.

SECT. X.

BUT though my preſent undertaking do not oblige me to conſider ſand-gold, otherwiſe than hydroſtatically; and though it highly concerns merchants and others, that deal in ſo rich a commodity as gold, and that is by ſo many ſtudiouſly adulterated, to be furniſhed with nice and truſty balances; yet, becauſe divers perſons, eſpecially ſeamen, that trade to the gold coaſt and other parts, where ſand-gold is to be met with, do, (perhaps too often) without being furniſhed with good ſcales and ſufficient ſkill to uſe them, venture upon buying ſuch precious wares; it will not be to depart from my general and main deſign, which is to ſerve the publick, if I deviate a little from my ſubject, and add to the hydroſtatical way, lately propoſed, of examining ſand-gold, two or three chemical ways to the ſame purpoſe. Firſt then, if he that would purchaſe ſand-gold, doubts that there are filings of braſs (or of copper) mixed with it; in caſe he have aqua fortis at hand, he may quickly diſcover the cheat, if there be any. For it is known to chemiſts, that aqua fortis will not work upon gold, and therefore if there be filings of braſs mixed with it, the operation of the menſtruum upon thoſe, together with the colour betwixt blue and green, it will thereby acquire, will diſcover the deceit. But, becauſe if nature hath mingled much ſilver with the gold, the proof by aqua fortis will require ſkill, and may puzzle thoſe that want it; I ſhall add, that good ſpirit of urine may be ſubſtituted

in

in its ſtead. For I elſewhere ſhew, that it will readily work upon filings of copper or braſs in the gold, and gain from them a fine blue colour; and this being a menſtruum not corroſive, like the other, but harmleſs to moſt bodies, and a good medicine for human bodies in ſeveral diſeaſes, (as the jaundice, pleuriſies, ſome kind of fevers, coughs, and aſthma's) may be fit to be carried about in voyages, and to be preferred to aqua fortis. And to make the operation of this liquor on filings of braſs far more quick, than if the ſolution be attempted an ordinary way, I thought upon the following expedient. I took filings of braſs, (and the like may be done with thoſe of copper) amounting to the weight but of eight or ten grains, or perhaps leſs; and having with my finger ſpread them ſomewhat thin upon a ſmall piece of white paper, I moiſtned them thoroughly with good ſpirit of fermented (or putrified) urine, (which will not diſſolve gold) that by this means the air might promote the diſſolutive action of the menſtruum; which accordingly it did ſo well, that, to the ſurpriſe of the beholders, there appeared in leſs than a quarter of an hour, and ſometimes in a few minutes, a manifeſt, if not alſo a deep and pleaſant blue colour upon the paper, or on ſome of the filings, or both. Thoſe that carry with them ſpirit of hartſhorn, or ſuch other volatile alcalies for medicinal uſes, (as ſome modern ſhip-chirurgeons do) may, for a need, employ that inſtead of ſpirit of urine. Nay, one may for the ſame purpoſe make uſe of urine itſelf never diſtilled, if it be ſtale and rank enough, (as it grows to be, ſooner in hot airs than in others:) ſince having for trial's ſake moiſtened with ſuch urine ſome filings of braſs, thinly ſpread on a piece of paper, there was a manifeſt blueneſs produced in about a quarter of an hour. But I thought alſo of another way, which I preſumed would be better liked by moſt traders, as more commodious; becauſe the agent being in a dry form, cannot, like ſpirituous liquors, be ſpilt; and though it be more eaſily procured, may ſerve the turn almoſt as well. This agent is common ſal armoniack, of which, when I have occaſion to uſe it, I reduce a greater quantity to powder, than I gueſs the quantity of water, I ſhall need, will diſſolve; that the liquor may be ſatiated with the ſalt. With this brine I thoroughly wet filings of braſs, (or copper) after the forementioned manner, thinly ſpreading them with my finger on a piece of paper, or ſome other fit and flat body; and in a ſhort time (as about a quarter of an hour or leſs) there will appear a greeniſh blue colour, drawn from the braſs by the liquor: which (liquor,) I ſuppoſe, I need not tell you, will not work on the gold, wherewith the braſs is mingled.

SECT. XI.

I HAVE obſerved ſuch a variety of appearances and diſguiſes of metalline bodies, and ſome other minerals, that I would adviſe thoſe that are given to the ſearch of mines, and other foſſils, to have their eyes always open when they paſs (eſpecially by land) from one place to another, that they may be ready to take notice of any unknown or uncommon foſſil, that they chance to ſee in their way; and that having taken it up, they do not neglect to poiſe it in their hands, (which after a little practice it will not be difficult to do, though not exactly, yet not unuſefully) and if they judge it to exceed the weight of cryſtal, or marble, to examine it hydroſtatically at their firſt conveniency. For there are in *England*, as well as in divers other countries, uſeful foſſils, that are wont to be overlooked by the unſkilful; and I have found in this kingdom, even upon, or very near the highways, eagle-ſtones, and ſome other minerals that were not ſuſpected to be of Engliſh growth. And I remember, that having occaſion, in the country, to paſs by the work-houſe of an ingenious potter, that I ſometimes imployed in his profeſſion; and having viewed the ground ſomewhat attentively, among ſome other uncommon foſſils that I took notice of, I made a diſcovery of manganeſe, or magneſia, whereof I gave the potter an advertiſement, which he afterwards thankfully made uſe of, having found the mineral very proper for the glazing and colouring of his veſſels.

NOR was this the only kindneſs, that ſkill in mineralogy, as little as mine was, enabled me then to do him. For he having invited me to view very privately, a place wherein there was great ſtore of a foſſil ſubſtance, that men knew not what to make of, becauſe they had not ſeen nor heard of the like in *England*: the knowledge I had of ſome Italian mines, made me quickly gueſs what it was that was taken for an unknown metal. For it is true, that this mineral was not divided into lumps of ſuch ſhapes and bigneſſes, as make glittering foſſils paſs for ſtones among the unſkilful, ſuch as are the marchaſites, whereof they make vitriol, and are found by the ſea-ſhore in or near the *Iſle of Wight*, and (though not ſo plentifully) in other parts of *England* (where I have found them) but ran a great way (and I had not time or liberty to try how far) under ground, like a vein of metalline ore. But this notwithſtanding, I judged the mineral to be but a marchaſite, in a form unuſual indeed in *England*, but which is not without reſemblers in ſome parts of *Italy*; which conjecture I found true the ſame day, by ſome eaſy trials that manifeſted it to abound much more in vitriolate ſalt, than any marchaſite that I had examined in the form of ſtones. So that, though I had no opportunity to try, whether or no it contained any better metal than iron; yet I concluded, that, *cæteris paribus*, it might be employed to make ſtore of vitriol, in far leſs time, and with far leſs coſt, than the marchaſites made uſe of in the vitriol works at *Deptford*, or elſewhere in *England*.

I REMEMBER alſo, that a mineral of an odd, though pretty appearance, being ſent me,

whoſe ſpecies was unknown to the mine-men that dug it up, I gueſſed that it was a foſſil, that I had not found in a good printed catalogue of our Engliſh minerals, namely, the ore of Biſmuth. And in this conjecture ſome trials, purpoſely made of that mineral, ſufficiently confirmed me, and gave me cauſe to be ſorry, that the vein, that afforded it, was ſo very ſmall, as the diggers found it, of an ore, that has properties enough; and is by ſome famous chemiſts affirmed to have ſome, that are not only rare, but wonderful.

BUT the chief thing, that invites me to recommend in this place, to thoſe that travel, an heedful eye on the ore-like, or ponderous ſubſtances, that may occur to them, is, that one of the applications of our general remark about the ſpecifick gravity of foſſils may be extended to an uſe, that has not, that I know of, been made by mineraliſts, and which yet I thought fit not to overlook: becauſe I ſee no need we ſhould be confined to examine only thoſe foſſils, whereof we can obtain parcels big enough to be weighed in water in the entire body. For beſides other minerals, that may be found profitable to the phyſician, the drugſter, or the mineraliſt, the ores, or wombs of metal themſelves, may be divers times found diſguiſed in the form of earth, or of mud, eaſy to be dried: which foſſils, though (becauſe they chance not to be found in lumps) unfit to be kept immediately ſuſpended by an horſe-hair, may be conveniently enough examined by the help of a glaſs-jar, whoſe weights in air, and water, and their difference, (which gives the ſpecifick weight of the veſſel) have been taken once for all, which I uſually call an *hydroſtatical bucket*. For this veſſel being almoſt filled with the propounded foſſil, and carefully counterpoiſed in the air, and then thoroughly wetted with water, and when it is ſo, warily let down into the water, and kept ſuſpended by an horſe-hair to a tender balance; when theſe things, I ſay, are done, the difference between the weight of the mineral and veſſel, when they are under water, and their former weight being obſerved; and the ſpecifick weight already found of the veſſel itſelf in water being ſubſtracted from that difference, there will remain the weight of the foſſil only, (which we here ſuppoſe to be heavier in ſpecie than water, and not to be diſſoluble in it) or the mineral itſelf in that liquor; and conſequently the proportion between that body, and water of the ſame bulk, as is elſewhere ſufficiently declared.

SECT. XII.

TO manifeſt, that this expedient may be of uſe in divers caſes, I ſhall only here obſerve, that a late author, who hath publiſhed an account of *Swedeland*, declares, that one of the beſt ſorts of Swedſh iron (which, you know, is much eſteemed in its kind) is divers times found in the form of a red mud, at the bottom of lakes, or far leſſer ſtagnant waters; which I the more readily believe, becauſe I have found ſome Engliſh okers (that paſs but for red earth, or ſtone of that colour) to be richer in iron than I found ſome famous ores of that metal to be. And another experienced writer, who gives us an account of the gold and ſilver mines of *America*, among which he ſpent ſeveral years, takes notice, that gold itſelf is found, from time to time, diſguiſed into a reddiſh earth, or is (though unſuſpectedly) harboured in it. An Italian mineraliſt, of repute in the laſt age, doth alſo take notice, that a reddiſh ſort of earth doth ſometimes contain a portion of the richeſt metals. I have obſerved ſome European diamonds, as many call a ſort of clear and finely figured cryſtals, to grow in a red earth, whence I have taken up pretty ſtore of them. And an inquiſitive traveller, who has been in the *Indies*, preſented me with a certain earth, which he affirmed to be from the diamond mines, (I preſume in the kingdom of *Colchonda*) which I found to be alſo red, and which I made ſome trials of, that belong not to this place. Vannochio.

SECT. XIII.

BUT the profitableſt uſe, that a mineraliſt may make of our hydroſtatical bucket, is to employ it much in weighing variety of coloured ſands and gravels, particularly ſome hereafter to be mentioned.

AND to let you ſee, by an eaſy inſtance, how apt we are to overlook ſands for want of trying them by weight, I ſhall not tell you, that I have ſometimes ſeen a ſort of ſand, that was ſlighted as common or worthleſs, which being waſhed and viewed in a microſcope, though none of the beſt, looked like an aggregate of ſmall granates, and perhaps was ſo; but ſhall here content myſelf to inſtance in that black ſand, that is commonly uſed in *London* and elſewhere, only to dry up the ink of words, that have been newly written. For having obſerved, when I had ſome quantity of this in my hand, that it was manifeſtly heavier than common ſand, I thought it worth the being examined by the hydroſtatical bucket; by which trial, that which we employed appeared to be to water of the ſame bulk, near about as $4\frac{6}{10}$ to 1. And having, for reaſons, that I cannot ſtay to mention, judged this ſand to be a mineral of a martial nature, I was confirmed in my conjecture, by melting it down with two or three parts of antimony, and caſting it into an iron cone. But I was more than confirmed in the ſame conjecture, when having tried it with a vigorous loadſtone, I found it to be far richer in metal than any of the Engliſh iron ores I had made trial of, and (except perhaps one) than any of the outlandiſh: for having taken, at adventures, ſome drachms out of a much larger quantity, and weighed it, I found, that at leaſt ſeven parts of eight would eaſily be taken up by the magnet. But ſuch obſervations as theſe are not the things, that chiefly move me to recommend the examen of ſands and gravels to the mineraliſt; particularly thoſe

ſorts of them, that being ſomewhat ponderous, are reddiſh or yellow, eſpecially if they retain thoſe colours, after they have been made red hot, and quenched in cold water.

But therefore to proceed to the mention of richer ſands, it is known, that from the coaſt of *Guinea* European traders, of ſeveral nations, do yearly bring gold to a great value, which is waſhed or picked out of the ſand. And even in *Europe* there are rivers, whoſe ſand is enriched by grains of gold, for which the *Tagus*, that runs by *Liſbon*, and *Pactolus*, were famous among the ancients. I knew an induſtrious chemiſt, who owned to me, that he got gold with profit from the ſand, which he found in ſome places of the banks of the Rhine: and there is a little river in *Savoy* proceeding from the mountains there, on whoſe banks, after a land-flood, I ſaw poor people buſy themſelves in ſeeking for grains of gold. Some trial (alſo) that I cauſed purpoſely to be made, confirmed me in a conjecture, which poſſibly may hereafter prove beneficial to many, namely, that the ſands of divers places, if they be ſkilfully treated by a dextrous chemiſt, may afford much more gold than is picked or waſhed out of them in form of grains. For beſides, that there may be many atoms, or corpuſcles of gold, that are ſo very minute, and ſtick ſo cloſe to grains of ſand, that they are neither taken notice of by the eye, nor ſeparable by waſhing and picking; beſides this, I ſay there may, as I conceive, be many particles of gold incorporated with the body of the ſand, which may be a kind of womb for matter of a golden nature, that a ſkilful artiſt, by the help of proper additaments, may ſeparate with profit, eſpecially if, with litharge or minium, he firſt reduce the ſand to a glaſs, and then take care to get the volatile gold, by giving it a pure body fit to retain and fix it, ſuch as is fine ſilver: out of which, I remember, we ſeparated by quartation, (though without profit, becauſe of the charges, and of the ſmall quantity we could work with at once) from as much vitrified ſand, and two or three fluxing additaments of ſmall price, as were contained in one crucible, (that broke too before the operation was near done) ſixteen grains of pure gold, that you may yet ſee, if you deſire it.

SECT. XIV.

It need not ſtartle you, that in reciting this experiment, I made mention of volatile gold. For though I know, that divers learned men, and ſome able chemiſts themſelves, look upon it as a fictitious thing, and that ſeems to bear a kind of contradiction in its very name, in regard of the perfect fixity they preſume to be an eſſential property of gold; yet I do not ſcruple to diſſent from them, being warranted ſo to do by my own experience. For I have more than once made uſe of a way, wherein, by the help of an additament, inconſiderable as to bulk, and leſs as to weight, one may, without a naked fire, and in a glaſs retort, ſublime gold, (not prepared by previous calcination) ſometimes in the form of a yellow or golden coloured ſalt; and ſometimes, when the operation ſucceeded better, in the form of thin cryſtals prettily ſhaped, gloſſy, and as red as rubies. But this upon the by; it may perhaps be more uſeful to ſearchers of rich foſſils not found in lumps, if I take this occaſion to obſerve, that when they meet with ſands, earths, mineral fragments, *&c.* that conſiderably exceed cryſtal in ſpecifick gravity; and by the place, wherein they are found, or by other tokens, give hopes of their containing corpuſcles of a golden nature: when this, I ſay, happens, it will not be adviſable, haſtily to reject ſuch bodies, but rather carefully to try, whether they do not deſerve a better uſage. For having ſometimes had the opportunity to diſcover corpuſcles of *Mars*, as chemiſts call iron and ſteel, in a far greater variety of foſſils and of diſguiſes, than even many noted chemiſts would have imagined, or ſome of them could, upon heedful trial, diſcover; I was much confirmed in my ſuſpicion, that corpuſcles of a golden nature may be concealed in divers bodies, which are thought not to contain any metal; and that in more of thoſe minerals, that are looked upon as ores of ſome other metal, becauſe of its being manifeſtly predominant, there may be mingled pretty ſtore of particles of gold or ſilver; which (becauſe of the greater quantity of that other metal, or mineral, that doth, as it were, cover or diſguiſe them) lie unperceived, and uſually unſuſpected, by perſons not very well acquainted with ſuch matters; and yet may, by one that is very ſkilful, be ſeparated even with profit.

SECT. XV.

But the grounds of the forementioned ſuſpicion being as yet but conjectural, I ſhall decline the particular mention of them in this place; and ſhall rather adviſe, with reference to ores in general, that thoſe, that would apply the hydroſtaticks to them, do labour to procure ſamples of the ores of differing mines, eſpecially if they be found in the ſame country; and do either by trial, or ſtrict enquiry, inform themſelves, what proportion of the metal, that denominates them, they contain. For theſe proportions of ores and minerals being carefully weighed in air and water, and their ſpecifick gravities being thereby made known, they may ſerve for a kind of ſtandard, by compariſon whereto we may oftentimes make not altogether unuſeful eſtimates of the metalline portions contained in other parcels of ore, of that ſpecies, whether afforded by the ſame mine, or vein of it, or by any other of the ſame metal hydroſtatically examined.

For inſtance, our Engliſh lead ores, that are worth taking notice of, may be, for diſtinction ſake, divided into three kinds or orders, and in each of theſe there may be allowed a latitude for greater or leſſer degrees

of goodneſs. The firſt ſort is of thoſe ores, that, in the ordinary way of melting, hold ſome of them from 30 ℔. of lead in an hundred weight of ore, to 40; and others to 45 ℔. of the ſame metal, and theſe by ſeveral are ſlighted as mean, and ſcarce, if at all, worth working, eſpecially thoſe, that hold under 35 or 40. As for the ſecond ſort, that reaches from 45 to 60 ℔. in the hundred, the moſt uſual proportion I have found in many trials, hath been about half the weight of the ore in clean and malleable lead. Theſe ores are thought indifferently good, and worth working: but other ores compriſed in this ſecond ſort held about 55, and ſome near 60, and theſe were looked upon, not only as good, but pretty rich. And for the third ſort, it conſiſts of thoſe, that yield from 60 to 80 in the hundred, and theſe ores are juſtly reputed very rich, (in lead) eſpecially theſe that come any thing near 80; for I confeſs, I never met with any that reached ſo far, but was aſſured by an ingenious and ſkilful gentleman, maſter of his majeſty's royal mint, that he had found ſome ſuch upon trial. But for me, I think that I have not above twice or thrice met with any that yielded me above 75. Theſe looked exceedingly promiſing, as if they were all metal, and I obſerved, whether the thing were caſual or not, ſome lumps to be compoſed of divers great cubes like dice, ſticking very hard to one another.

THE conſiderations, that moved me to offer the advice given at the beginning of this ſection, invited me to make reſearches of the ſpecifick gravity, not only of divers Engliſh ores, as of lead, tin, *&c.* of which I had carefully made a collection, (that was loſt by a ſudden fire, broke out in the place where I kept them) but of the ores, that were preſented me from ſeveral countries, both in *Europe* and *America*; as Swediſh copper and iron ores, German ſilver and tin glaſs ores; Hungarian antimonial ores; *New England* lead, iron, and copper ores, *&c.* The effects of ſome few of which reſearches, that chanced to come to hand, whilſt I was ſeeking for ſome hydroſtatical trials of drugs, I thought it not amiſs to inſert in a table annexed to the *Medicina Hydroſtatica*; becauſe perhaps they may be of ſome uſe in making a previous conjecture, about a mine's being, or not being likely to be wrought with profit, all other things concurring that ſhould do ſo. Which laſt clauſe I deſire ſhould be taken notice of, becauſe there are divers other circumſtances, beſides the proportion of the metalline part in the foſſil, that are fit to be conſidered, [as the plenty or ſcarcity of the mineral, the eaſineſs or difficulty of coming at it, becauſe of its depth, or its being, or not being troubled with waters, *&c.* its nearneſs to plenty of fuel, and the conveniency of water to drive mills; its nearneſs to, or remotneſs from the ſea, or ſome navigable river, convenient for its tranſportation, to omit other important circumſtances] before one begins to work a mine; which, as they happen to be commodious or inconvenient, may render the attempt adviſable or imprudent.

BUT, Sir, I perceive (though late) that I have forgot I was to write, not a book of the trial of ores and other minerals, but a moderately ſized letter about an hydroſtatical way of exploring their ſpecifick gravity. And therefore, to avoid encreaſing the already too great prolixity of this paper, by making an apology for it, I ſhall lengthen it, only to beg you to pardon it, and to look upon the writer as,

SIR,

Your moſt humble

and obedient ſervant,

R. B.

ADVERTISEMENT.

TO give the curious the ſatisfaction of ſeeing at one view, and of ſo eaſily comparing together the ſpecifick gravities of a good number and variety of bodies, and to ſave them the labour of turning over many leaves of the foregoing tract, to find the particular body, whoſe ponderoſity they deſire to know; I have cauſed to be annexed a table, containing in an alphabetical order (though not a ſcrupulouſly exact one) the names of the drugs, and other bodies, whoſe gravities are delivered in the foregoing papers, without ſcrupling to add ſome others, that I chanced to light on in turning over ſome of my old and forgotten notes.

BUT I muſt to the following table premiſe this advertiſement, (warranted by ſeveral paſſages of the foregoing papers here laid together) that it is not to be expected, every one, that ſhall try the ſpecifick gravities of the bodies here mentioned, ſhall find all of them to be preciſely the ſame, that the table exhibits: ſince (not to mention, that perhaps every experimenter will not employ ſo much care, and be aſſiſted with ſo much uſe in making hydroſtatical trials, as thoſe this table conſiſts of were made with) the difference, that may ſometimes be found between his trials and mine, may very probably be imputed to that variety of texture and compactneſs, that may be found in ſeveral bodies of the ſame kind or denomination, neither nature nor art being wont to give all the productions, that bear the ſame name, a mathematical preciſeneſs, either in gravity or in other qualities.

The TABLE

	Weight In air in gr.	Weight In water in gr.	Proportion.
A			
AMBER — —	306	12	$1\frac{4}{100}$ to 1.
Agat — — —	251	156	$2\frac{64}{100}$ to 1.
A piece of alum-ſtone —	$280\frac{3}{4}$	$152\frac{1}{4}$	$2\frac{18}{100}$ to 1.
Antimony good and ſuppoſed to be Hungarian one —— —— ——	391	295	$4\frac{7}{100}$ to 1.
B			
Bezoar-ſtone — —	187	61	$1\frac{48}{100}$ to 1.
A piece of the ſame —	$56\frac{1}{2}$	22	$1\frac{64}{100}$ to 1.
A fine oriental one —	172	60	$1\frac{53}{100}$ to 1.
Another — — —	237	61	$1\frac{34}{100}$ to 1.
C			
Coral red —— —	$129\frac{1}{4}$	$80\frac{1}{4}$	$2\frac{63}{100}$ to 1.
Cryſtal — — —	256	140	$2\frac{21}{100}$ to 1.
Cornelian — — —	148	103	$3\frac{29}{100}$ to 1.
Calculus humanus — —	2570	1080	$1\frac{72}{100}$ to 1.
Coco-ſhell — — —	331	85	$1\frac{34}{100}$ to 1.
Native crabs eyes — —	$77\frac{1}{2}$	$36\frac{1}{2}$	$1\frac{89}{100}$ to 1.
Crabs eyes artificial —	$90\frac{1}{2}$	54	$2\frac{48}{100}$ to 1.
Calx of lead — — —	$138\frac{1}{2}$	123	$8\frac{94}{100}$ to 1.
Copper-ſtone — —	$65\frac{1}{2}$	$49\frac{1}{2}$	$4\frac{9}{100}$ to 1.
Common cinnabar — —	802	702	$8\frac{1}{10}$ to 1.
Cinnabar of antimony —	197	169	$7\frac{3}{100}$ to 1.
Cinnabar native — —	197	171	$7\frac{57}{100}$ to 1.
Coral white — —	336	204	$2\frac{54}{100}$ to 1.
Another piece fine —	139	85	$2\frac{57}{100}$ to 1.
Calculus humanus — —	302	97	$1\frac{47}{100}$ to 1.
Copper ore — — —	1436	1090	$4\frac{15}{100}$ to 1.
Copper ore rich — —	413	314	$4\frac{17}{100}$ to 1.
Cinnabar native, very ſparkling — — —	226	194	$7\frac{6}{100}$ to 1.
G			
Gold ore not rich, brought from the *Eaſt-Indies* —	1100	682	$2\frac{63}{100}$ to 1.
Another lump of the ſame	1151	717	$2\frac{65}{100}$ to 1.
Granati Minera — —	217	147	$3\frac{1}{10}$ to 1.
Granate Bohemian ——			$4\frac{36}{100}$ to 1.
H			
Hæmatites Engliſh —	1574	1156	$3\frac{76}{100}$ to 1.
I			
Ivory — — — —	$173\frac{1}{2}$	83	$1\frac{91}{100}$ to 1.
L			
Lapis manati — —	450	293	$2\frac{86}{100}$ to 1.
A fragment of the ſame	$218\frac{1}{2}$	123	$2\frac{29}{100}$ to 1.
Another — — —	345	197	$2\frac{33}{100}$ to 1.
Another from *Jamaica*	2011	1127	$2\frac{27}{100}$ to 1.
Lapis lazuli one piece —	385	256	$2\frac{98}{100}$ to 1.
Lead ore — — —	686	590	$7\frac{14}{100}$ to 1.
Another — — —			
Lapis calaminaris — —	477	380	$4\frac{92}{100}$ to 1.
Lapis judaicus — —	$261\frac{1}{2}$	164	$2\frac{69}{100}$ to 1.
M			
Marcaſites — — —	814	631	$4\frac{45}{100}$ to 1.
Another from *Stalbridge*	243	189	$4\frac{1}{2}$ to 1.
Another more ſhining than ordinary — —	287	227	$4\frac{78}{100}$ to 1.
Mercury revived from ore			
Manganeſe a piece — —	321	230	$3\frac{53}{100}$ to 1.
Mineral Corniſh like a ſhining marcaſite —	145	129	$9\frac{6}{100}$ to 1.
O.			
Oſteocolla — — —	195	108	$2\frac{24}{100}$ to 1.
Ore ſilver choice from *Saxony* — — —	458	366	$4\frac{97}{100}$ to 1.
Another piece — —	1120	960	7 to 1.
Ore lead from *Cumberland* rich — — — —	1872	$1586\frac{1}{2}$	$\frac{54}{100}$ to 1.
R			
Rhinoceros horn — —	8563	4260	$1\frac{99}{100}$ to 1.
Rock-cryſtal, another piece —— ——	256	140	$2\frac{20}{100}$ to 1.
S			
Sapphir — — —			
Seed pearl — — —			
Sulphur vive — —	371	185	2 to 1.
Germane very fine ——	306	152	$1\frac{98}{100}$ to 1.
Slate Iriſh — — —	779	467	$2\frac{49}{100}$ to 1.
T			
A piece of talc like lapis amianthus — —	596	334	$2\frac{28}{100}$ to 1.
Talc { Venetian — —	802	508	$2\frac{73}{100}$ to 1.
Talc { Jamaican — —	1857	1238	3 to 1.
New Engliſh tin ore, Mr. *Hubert's* — —	812	613	$4\frac{8}{100}$ to 1.
Tin ore black rich —	1293	984	$4\frac{13}{100}$ to 1.
Another piece choice —	2893	2314	5 to 1.
Tutty a piece — —	104	83	5 to 1.
Tin-glaſs — — —	468	419	$9\frac{55}{100}$ to 1.
V			
Vitrum Antimonii per ſe	$357\frac{1}{2}$	$282\frac{1}{2}$	$4\frac{76}{100}$ to 1.
Vitriol Engliſh, a very fine piece — — —	1093	512	$1\frac{88}{100}$ to 1.
Unicorns horn a piece	407	195	$1\frac{91}{100}$ to 1.

POSTSCRIPT.

WHEN I began to ſend the eſſay, called, *Medicina Hydroſtatica*, to the preſs, and drew up the foregoing preface to it, I intended it ſhould, in the ſame book or volume, be accompanied by another help or two, to explore and improve the *Materia Medica*. But when the eſſay itſelf, and the annexed epiſtle about a previous exploration of ores had been printed off, I could not but perceive, that the bulk of thoſe two tracts ſo far exceeded what I expected, that if I ſubjoined what I at firſt deſigned to add to it, it would prove a miſ-ſhapen book, and inconvenient to be opened. Wherefore it ſeemed expedient to divide the whole intended work into two volumes or tomes, whereof what had already paſt the preſs ſhould make the firſt, which, that it might be the ſooner ſerviceable, ſhould forthwith come abroad by it ſelf; and the ſecond ſhould conſiſt partly of the other papers abovementioned, as relating to the *Materia Medica*, and partly of a ſupplement to the firſt tome, containing divers hiſtorical paralipomena, that by miſtake were omitted, and are fit to be there ſupplied out of a fuller copy, than that, which by an overſight was made uſe of at the preſs.

THE

THE

CHRISTIAN VIRTUOSO:

SHEWING,

That by being addicted to experimental philoſophy, a man is rather aſſiſted than indiſpoſed to be a good Chriſtian.

The FIRST PART.

To which are ſubjoined,

I. A diſcourſe about the diſtinction, that repreſents ſome things as above reaſon, but but not contrary to reaſon.

II. The firſt chapters of a diſcourſe, entitled, Greatneſs of mind promoted by Chriſtianity.

The PREFACE.

WHEN many years ago I was induced to write ſomething about the ſubject of the following treatiſe, I did it partly to give ſome ſatisfaction to a friend, and partly to impoſe upon myſelf an obligation, to conſider the more attentively, upon what grounds it may be aſſerted, that there is no inconſiſtence between a man's being an induſtrious virtuoſo, and a good Chriſtian. How little fond I was of troubling the publick with a diſcourſe of this nature, may be gueſſed by my having thrown it aſide, among other neglected papers, for ſeveral years. And it had ſtill continued in that obſcurity, if the formerly unprevalent deſires of thoſe, that would have it appear in publick, had not been enforced by an obſervation or two, that I could not but make. For I could ſcarce avoid taking notice of the great and deplorable growth of irreligion, eſpecially among thoſe, that aſpired to paſs for wits, and ſeveral of them too for philoſophers. And on the other ſide it was obvious, that divers learned men, as well as others, partly upon the ſcore of their abhorrence of theſe infidels and libertines, and partly upon that of a well-meaning but ill-formed zeal, had brought many good men to think, that religion and philoſophy were incompatible; both parties contributing to the vulgar error, but with this difference, that the libertines thought a virtuoſo ought not to be a Chriſtian, and the others, that he could not be a true one.

IT is like it may ſeem to ſome readers, that I have too much enlarged the notion of experience, and too much inſiſted on the proofs deducible from that topick: but it is not improbable, that others may approve the reaſons, with which that ample notion of experience is, where it is propoſed, accompanied. And the ingenious perſon, I was chiefly to pleaſe, being a lover and valuer of experience, and of arguments grounded on it, the deſire of gratifying him enticed me to ſay ſo much, that when I took up the thoughts of making this treatiſe publick, I found the effects of my complaiſance ſo interwoven with the other parts of the diſcourſe, that I could not make any great alteration, (for ſome I did make) without almoſt ſpoiling the contexture of it.

I HOPE the equitable reader will not expect to find every ſubject, of which I have occaſion to diſcourſe, fully treated of: for I neither deſigned nor pretended to write a body of natural theology, nor a demonſtration of the Chriſtian religion, but thought it ſufficient for me to conſider the points I wrote of, as far forth as was neceſſary or very conducive to my purpoſe. And therefore I thought myſelf not only warranted, but obliged (in point of diſcretion) to decline the mention of ſeveral arguments and reflections, that would indeed have been very proper, if my deſign had been to ſhew, why one ſhould be a Chriſtian; but impertinent to ſhew, that a virtuoſo, while ſuch, may be a true Chriſtian. But as for this reaſon, I omitted many things, that would have enriched or adorned my diſcourſe; ſo I have endeavoured to make ſome amends, both by ſuggeſting ſome new ſubjects, and

by adding, on thoſe that have been already treated of by others, divers thoughts, into which I was led by the attentive conſideration of the ſubject itſelf; on which ſcore, they may probably not have yet occurred to the reader, and may appear to him, either to be new as to the ſubſtance, or if any of them be coincident with the more known ones, to have ſomething peculiar as to the way of propounding or of applying them. And, I confeſs, I was ſomewhat encouraged to communicate my thoughts on theſe ſubjects, by conſidering, that (though it ought not to be ſo, yet) it is notorious, that in the age we live in, there are too many perſons, that are like to be found more indiſpoſed to be impreſſed on by arguments, in favour of religion, from profeſſed divines, how worthy ſoever, than from ſuch as I, who am a layman, and have been looked upon as no undiligent cultivator of experimental philoſophy. And that the ſtile might not be unſuitable to the writer, and the deſign, I thought fit, in my arguments and illuſtrations, both to employ compariſons drawn from teleſcopes, microſcopes, *&c.* and to make frequent uſe of notions, hypotheſes, and obſervations, in requeſt among thoſe, that are called the new philoſophers. Which I the rather did, becauſe ſome experience has taught me, that ſuch a way of propoſing and elucidating things, is either as moſt clear, or, upon account of its novelty, wont to be more acceptable than any other to our modern virtuoſi; whom thus to gratify is a good ſtep towards the perſuading of them. For it is eaſy to obſerve, that ſome men are more acceſſible to truth, and will be more prevailed upon by it, when it is preſented to them in one dreſs, than when it appears in another; as we daily ſee, that ſome perſons will be more eaſily prevailed with to take a medicine, and that it will have a more kindly operation upon them, if it be exhibited in that form and conſiſtence, that is beſt liked by the patients; whereof ſome love to have the ingredients the medicine is to conſiſt of, offered them in a liquid, others in a ſoft, and others in a dry form.

THOUGH I am wont, as well as inclinable, to ſpare the preſent age; and though my cenſures of ſome reputed virtuoſi, that live in it, are written with as harmleſs and friendly deſigns, as was the ſeeming rudeneſs of the angel to St. *Peter*, when he ſtruck him on the ſide, and haſtily rouzed him, but to awake him, to take off his chains, and to free him from the danger that threatned him; yet I ſhall be more troubled and ſurpriſed, if I ſhall find the following treatiſe diſliked by divers perſons, that would paſs for virtuoſi, and by ſome that are really ſo. For ſome men, that have but ſuperficial, though conſpicuous wits, are not fitted to penetrate ſuch truths as require a laſting and attentive ſpeculation; and divers, that want not abilities, are ſo taken up by their ſecular affairs, and their ſenſual pleaſures, that they neither have diſpoſition, nor will have leiſure to diſcover thoſe truths, that require both an attentive and penetrating mind. And more than either of theſe ſorts of men there are, whom their prejudices do ſo foreſtal, or their intereſt biaſs, or their appetites blind, or their paſſions diſcompoſe, too much to allow them a clear diſcernment and right judgment of divine things. Upon which, and other accounts, I ſhall not think it ſtrange, if what I write ſhall make no great impreſſion on readers thus qualified, whom to convert, it is not enough to convince them: nor ſhall I be greatly diſcouraged, or think much the worſe of my arguments, if they do not make proſelytes of thoſe, whom ſiniſter conſiderations make ſuch reſolved adverſaries to the truth, that he alone, that can preach from heaven, is able to prevail upon them; and they muſt be converted almoſt as *Saul* the perſecutor was, by an extraordinary light from heaven, and a power able to ſtrike them to the ground. But though I am not ſo little acquainted with the preſent age, as to expect to plead for religion with the approbation of atheiſts, or of libertines; yet I ſhall not think my pains altogether miſpent, if what I have written, either ſtartle any irreligious reader ſo far, as to engage him to conſult abler aſſertors of Chriſtianity and virtue, than I pretend to be; or elſe prove ſo happy, as to confirm and ſtrengthen, by new arguments and motives, thoſe, that have heartily embraced the Chriſtian faith and morals, though perhaps not upon the firmeſt grounds. For it will be no ſmall ſatisfaction to me, if though I cannot convert the reſolvedly irreligious, I ſhall at leaſt furniſh thoſe, that are not ſo, with preſervatives againſt them, and hinder their impiety from being contagious.

BUT I fear, that thoſe, that are enemies, both to the doctrines I propoſe, and to the aims I purſue, will not be the only perſons, that will find fault with the following tract; ſince perhaps, there will not be wanting ſome ingenious men, that expected, as well as deſired, that I ſhould never write but as a naturaliſt, becauſe they themſelves eſteem nothing, ſave the laws and phœnomena of nature, to be ſubjects worthy of a philoſophical pen: as if, becauſe rational ſpirits are inviſible and immaterial beings, all diſquiſitions about them muſt be airy and uncertain ſpeculations, and, like their objects, devoid of ſolidity and uſefulneſs. But though among theſe ingenious men there are ſeveral, whoſe expectations from me I am much more diſpoſed to gratify, than appoint; yet, on ſuch an occaſion as this, I muſt take the liberty to own, that I do not think the corporeal world, nor the preſent ſtate of things, the only or the principal ſubjects, that an inquiſitive man's pen may be worthily employed about; and that there are ſome things, that are grounded neither upon mechanical nor upon chemical notices or experiments, that are yet far from deſerving to be neglected, and much leſs to be deſpiſed, or ſo much as to be left uncultivated, eſpecially by ſuch writers, as being more concerned to act as Chriſtians, than as virtuoſi, muſt alſo think, that ſometimes they may uſefully buſy themſelves about the

ſtudy

ſtudy of divine things, as well as at other times employ their thoughts about the inſpection of natural ones. There are ſome objects, whoſe nobleneſs is ſuch, that though we derive no advantage from them, but the contentment of knowing them, and that but very imperfectly too; yet our virtuoſi themſelves juſtly think much pains and time, and perhaps coſt too, well ſpent in indeavouring to acquire ſome conjectural knowledge of them: as may be inſtanced in the aſſiduous and induſtrious reſearches they have made about the remote cœleſtial part of the world, eſpecially the ſtars and comets, that our age has expoſed to their curioſity. For moſt of theſe, though they require chargeable teleſcopes, and tedious, as well as unhealthy nocturnal obſervations, are objects, of which we can know very little with any certainty; and which, for ought appears, we can make no uſeful experiments with. Since therefore we ſo much prize a little knowledge of things, that are not only corporeal, but inanimate; methinks we ſhould not undervalue the ſtudies of thoſe men, that aſpire to the knowledge of incorporeal and rational beings, which are incomparably more noble than all the ſtars in the world, which are, as far as we know, but maſſes of ſenſeleſs and ſtupid matter. Since alſo the virtuoſi deſervedly applaud and cheriſh the laborious induſtry of anatomiſts, in their enquiries into the ſtructure of dead, ghaſtly, and oftentimes unhealthfully as well as offenſively fœtid bodies; can it be an employment improper for a Chriſtian virtuoſo, or unworthy of him, to endeavour the diſcovery of the nature and faculties of the rational mind, which is that, that ennobles its manſion, and gives man the advantage he has of the beaſts that periſh?

I AM content, that merely natural philoſophy ſhould often employ my thoughts and my pen; but I cannot conſent it ſhould engroſs them, and hinder me from being converſant with theological ſubjects. And ſince, among my friends, I have ſome (and thoſe not inconſiderable for their number, and much leſs for their merit) that preſs me to treat of religious matters, as well as others, that would have me addict myſelf to cultivate phyſical ones; I, who think myſelf a debtor to both theſe ſorts, am willing to endeavour to gratify both; and having already, on many occaſions, preſented the latter ſort with large, as well as publick, effects of my complaiſance for them, I hope, they will not think it ſtrange, that I ſhould now and then have regard to the former ſort, too; eſpecially ſince I had higher motives than complaiſance ought to be, to induce me to treat ſometimes of things, that might be grateful to thoſe friends, that are much ſo to religious compoſures.

I PRESUME it will be taken notice of, that, in the following treatiſe, as well as in divers of my other writings, eſpecially about ſubjects that are purely, or partly, philoſophical, I make frequent uſe of ſimilitudes, or compariſons: and therefore I think my ſelf here obliged to acknowledge once for all, that I did it purpoſely. And my reaſons for this practice were, not only becauſe fit compariſons are wont to delight moſt readers, and to make the notions they convey better kept in memory; whence the beſt orators and preachers have made great and ſucceſsful uſe of metaphors, allegories, and other reſemblances; but I was induced to employ them chiefly for two other reaſons: 1. That though I freely confeſs, that arbitrary ſimilitudes, and likewiſe thoſe that are foreign to the ſubject treated of, ſuch as are moſt of the vulgar ones, that are uſually borrowed from the fictions of the poets, and from the uncertain and often ill-applied relations of *Pliny*, *Ælian*, and other too frequently fabulous writers, are ſcarce fit to be made uſe of but to vulgar readers, or popular auditories; yet compariſons fitly choſen, and well applied, may, on many occaſions, uſefully ſerve to illuſtrate the notions, for whoſe ſake they are brought, and, by placing them in a true light, help men to conceive them far better than otherwiſe they would do. And, 2. appoſite compariſons do not only give light, but ſtrength, to the paſſages they belong to, ſince they are not always bare pictures and reſemblances, but a kind of arguments; being oftentimes, if I may ſo call them, analogous inſtances, which do declare the nature, or way of operating, of the thing they relate to, and by that means do in a ſort prove, that, as 'tis poſſible, ſo it is not improbable, that the thing may be ſuch as it is repreſented: and therefore not only the illuſtrious *Verulam*, though not more a florid, than a judicious writer, has, much to the ſatisfaction of his readers, frequently made uſe of compariſons, in whoſe choice and application he was very happy; but that ſevere philoſopher, monſieur *Des Cartes* himſelf, ſomewhere ſays, that he ſcarce thought, that he underſtood any thing in phyſicks, but what he could declare by ſome apt ſimilitude; of which, in effect, he has many in his writings; [as where he compares the particles of freſh water to little eels; and the corpuſcles of ſalt in the ſea-water to little rigid ſtaves; and where, after the Stoicks, he compares the ſenſe of objects by the intervention of light to the ſenſe, that a blind man hath of ſtones, mud, *&c.* by the intervention of his ſtaff.] To which I ſhall add, that proper compariſons do the imagination almoſt as much ſervice, as microſcopes do the eye; for, as this inſtrument gives us a diſtinct view of divers minute things, which our naked eyes cannot well diſcern, becauſe theſe glaſſes repreſent them far more large, than by the bare eye we judge them; ſo a ſkilfully choſen and well applied compariſon much helps the imagination, by illuſtrating things ſcarce diſcernible, ſo as to repreſent them by things much more familiar and eaſy to be apprehended.

I CONFESS I might, on ſome occaſions, have ſpoken, not only more poſitively and boldly, but, as to many learned readers, more acceptably, if I would have diſcourſed altogether like a Carteſian, or as a partizan of ſome other modern ſect of philoſophizers. But,

beſides

beſides that I am not minded to give myſelf up to any ſect, I thought it convenient, that a diſcourſe, deſigned to work on perſons of differing perſuaſions about philoſophical matters, ſhould not declare itſelf dogmatically, or unreſervedly, of a party; but employ rather the dictates of reaſon, or principles either granted or little conteſted, than proceed upon the peculiar principles of a diſtinct party of philoſophizers.

If now and then I have inſiſted upon ſome particular ſubjects, more than appears abſolutely neceſſary, I did it, becauſe that, though I wrote this treatiſe chiefly for my friends, yet I did not write it for them only, but was willing to lay hold on ſome of the occaſions, that the ſeries of my diſcourſe offered me, to excite in my ſelf thoſe diſpoſitions, that I endeavoured to produce in others, and, by inſiſting upon ſome reflections, impreſs them more deeply upon my own mind; eſpecially when I was treating of ſome points, either ſo important, or ſo oppoſed, or both, that they can ſcarce be too much inculcated.

The name of the perſon, to whom the following papers were addreſſed, not being neceſſary to be made publick, ſome reaſons made it thought convenient, that it ſhould remain unmentioned.

POSTSCRIPT.

To give an account of the prolixity, that ſome might otherwiſe cenſure, of the foregoing preface, I muſt advertiſe the reader, that it is of an ancient date; and that the firſt part of the treatiſe, that it belongs to, was already written, and it was then deſigned, that the ſecond part ſhould accompany it to the preſs: on which ſcore it was preſumed, that, as the particulars, that make up the preamble, would not appear ſuperfluous, in regard of the variety of ſubjects to be treated of; ſo its length would ſcarce be found diſproportionate to the bulk of the whole deſigned book.

THE

CHRISTIAN VIRTUOSO:

SHEWING,

That by being addicted to experimental philoſophy, a man is rather aſſiſted than indiſpoſed to be a good Chriſtian.

The FIRST PART.

SIR,

I PERCEIVE by what you intimate, that your friends Dr. *W.* and Mr. *N.* think it very ſtrange, that I, whom they are pleaſed to look upon as a diligent cultivater of experimental philoſophy, ſhould be a concerned embracer of the Chriſtian religion; though divers of its articles are ſo far from being objects of ſenſe, that they are thought to be above the ſphere of reaſon. But though I preſume they may find many objects of the like wonder, among thoſe with whom I am compriſed by them, under the name of the new virtuoſi; and among theſe, they may meet with divers perſons more able than I, to eaſe them of their wonder; yet ſince they are pleaſed by ſingling me out, as it were to challenge me to do it, I ſhall endeavour to make them think it at leaſt leſs ſtrange, that a great eſteem of experience, and a high veneration for religion, ſhould be compatible in the ſame perſon. Wherefore I ſhall not deny, that I am now and then buſied in deviſing, and putting in practice, trials of ſeveral ſorts, and making reflections upon them: and I own too, that (about natural things) I have a great reverence for experience, in compariſon of authority. But withal, I declare, that to embrace Chriſtianity, I do not think I need to recede from the value and kindneſs I have for experimental philoſophy, any thing near ſo far as your friends ſeem to imagine. And I hope it will appear, that if the experimental way of philoſophiſing I am addicted to have any things in it, that indiſpoſe a man to aſſent to the truth, and live according to the laws of the Chriſtian religion; thoſe few things are more than countervailed by the peculiar advantages, that it affords a man of a well-diſpoſed mind, towards the being a good Chriſtian.

I said, a man of a well-diſpoſed mind, that is, one, that is both docile, and inclined to make pious applications of the truths he diſcovers; becauſe ſuch a qualification of mind, I hope, God, through his goodneſs, has vouchſafed me; and the occaſion given by your friends to the following diſcourſe relating peculiarly to me, a perſonal account of my opinions, and reaſons of them, ought to ſuffice. And it will be *ex abundanti*, (as they ſpeak) if my diſcourſe be found, as it often will be, to extend much further. Which reflection,

fiection I desire you would frequently have in your thoughts, to prevent mistaking the design of the following epistle.

I DOUBT not, but the popular prejudices, that I perceive your two friends, among many other more devout than well-informed persons, have entertained, will make them think, that what I have now delivered needs good proof, and perhaps better than it is capable of. And therefore I hope you will easily allow me the liberty, I am going to take, of briefly premising some things, to clear the way for the principal points designed to be discoursed of in this letter.

I KNOW you need not be told, that the philosophy, which is most in request among the modern virtuosi, and which by some is called the new, by others the corpuscularian, by others the real, by others (though not so properly) the atomical, and by others again the Cartesian, or the mechanical philosophy, is built upon two foundations, reason and experience. But it may not be impertinent to observe to you, that although the peripatetick, and some other philosophies, do also pretend to be grounded upon reason and experience; yet there is a great difference betwixt the use, that is made of these two principles, by the school-philosophers, and by the virtuosi. For those, in the framing of their system, make but little use of experience; contenting themselves for the most part to employ but few and obvious experiments, and vulgar traditions, usually uncertain, and oftentimes false; and superstructing almost their whole physicks upon abstracted reason; by which I mean the rational faculty, endowed but with its own congenit or common notions and ideas, and with popular notices; that is, such as are common among men, especially those that are any thing learned. But now, the virtuosi I speak of, and by whom, in this whole discourse, I mean those, that understand and cultivate experimental philosophy, make a much greater and better use of experience in their philosophical researches. For they consult experience both frequently and heedfully; and, not content with the phænomena, that nature spontaneously affords them, they are solicitous, when they find it needful, to enlarge their experience by trials purposely devised; and ever and anon reflecting upon it, they are careful to conform their opinions to it; or, if there be just cause, reform their opinions by it. So that our virtuosi have a peculiar right to the distinguishing title, that is often given them, of experimental philosophers.

I CAN scarce doubt, but your friends have more than once obliged you to take notice of the profane discourses and licentious lives of some virtuosi, that boast much of the principles of the new philosophy. And I deny not, but that, if the knowledge of nature falls into the hands of a resolved atheist, or a sensual libertine, he may misemploy it to oppugn the grounds, or discredit the practice of religion. But it will fare much otherwise, if a deep insight into nature be acquired by a man of probity and ingenuity, or at least free from prejudices and vices, that may indispose him to entertain and improve those truths of philosophy, that would naturally lead him to sentiments of religion. For, if a person thus qualified in his morals, and thereby disposed to make use of the knowledge of the creatures to confirm his belief, and encrease his veneration of the Creator (and such a person I here again advertise you, and desire you would not forget it, I suppose the virtuoso, this paper is concerned in, to be) shall make a great progress in real philosophy; I am persuaded, that nature will be found very loyal to her author; and instead of alienating his mind from making religious acknowledgments, will furnish him with weighty and uncommon motives, to conclude such sentiments to be highly rational and just. On which occasion I must not pretermit that judicious observation of one of the first and greatest experimental philosophers of our age, Sir *Francis Bacon*, that God never wrought a miracle to convince atheists; because in his visible works he had placed enough to do it, if they were not wanting to themselves. The reason he gives for which remark, I shall confirm, by observing, that it is intimated in a passage of St. *Paul*, asserting both "that the invisi- Rom. i. 20.
"ble things of God are clearly seen from the "creation of the world," as tokens and effects (as I remember the particle ἀπὸ in the Greek doth elsewhere signify) and that his divinity and eternal power may be so well understood by the things that are made, that the Gentiles, who had but the light of nature to lead them to the acknowledgment of the true God, were excuseless, for not being brought by that guide to that acknowledgment.

AND indeed, the experimental philosophy giving us a more clear discovery, than strangers to it have, of the divine excellencies displayed in the fabrick and conduct of the universe, and of the creatures it consists of, very much indispoſeth the mind, to ascribe such admirable effects to so incompetent and pitiful a cause as blind chance, or the tumultuous justlings of atomical portions of senseless matter; and leads it directly to the acknowledgment and adoration of a most intelligent, powerful, and benign author of things, to whom alone such excellent productions may, with the greatest congruity, be ascribed. And therefore, if any of the cultivators of real philosophy pervert it to countenance atheism, it is certainly the fault of the persons, not the doctrine; which is to be judged of by its own natural tendency, not by the ill use, that some bad men may make of it; especially if the prevaricating persons are but pretenders to the philosophy they misemploy; which character will perhaps be found to belong to most, if not all, the atheistical and profane men, the objection means. For most of these do as little understand the mysteries of nature, as believe those of Christianity; and of divers of them it may be truly said, that their sensuality, and lusts, and passions, darkened and se-

duced their intellects: their immorality was the original cause of their infidelity; nor were they led by philosophy to irreligion, but got and perverted some smattering of philosophy, to countenance the irreligious principles, they brought with them to the study of it.

BUT all this notwithstanding, I fear, if not foresee, that you will surmise, that the study of natural philosophy, how innocent soever it may be in it self, will, in this libertine city, engage me to converse with many, who, though they pass for virtuosi, are indeed atheists; whose contagious company must endanger, if not infect me.

THIS obliges me to tell you, that though I have no reason to take it at all unkindly, that you are jealous of me on the score of being solicitous for my safety; yet I hope my danger is not so great as you may apprehend it. For first, I must own to you, that I do not think there are so many speculative atheists, as men are wont to imagine. And though my conversation has been pretty free and general among naturalists, yet I have met with so few true atheists, that I am very apt to think, that mens want of due information, or their uncharitable zeal, has made them mistake or misrepresent many for deniers of God, that are thought such, chiefly because they take uncommon methods in studying his works, and have other sentiments of them, than those of vulgar philosophers. And in the next place I must tell you, that having, through the goodness of God, chosen my religion, not inconsiderately, but upon mature deliberation, I do not find those virtuosi, you call atheists, such formidable adversaries, as those that are afraid to hear them, do, by that apprehension, appear to think them. And indeed, I have observed the physical arguments of the atheists to be but very few, and those far enough from being unanswerable. And as for the very chief of them, though they are wont to puzzle such as are not versed in nice speculations, because they represent the assertion of a deity as a doctrine encumbered with inextricable difficulties; yet I do not think the objections solidly grounded, since the same difficulties, or others not inferior, may be urged against those hypotheses and principles, that the deniers of God do or must admit. And indeed, most of the perplexing difficulties the atheists lay so much stress on, do not proceed from any absurdity contained in the tenent of the theists, but from the nature of things; that is, partly from the dimness and other imperfections of our human understandings, and partly from the abstruse nature, that, to such bounded intellects, all objects must appear to have, in whose conception infinity is involved; whether that object be God, or atoms, or duration, or some other thing, that is uncausable. For, however we may flatter our selves, I fear we shall find, upon strict and impartial trial, that finite understandings are not able clearly to resolve such difficulties, as exact a clear comprehension of what is really infinite.

BUT to pursue this discourse would lead us too far. And it is more fit, after so much has been said concerning not only the design of this tract, but the new philosophy, the virtuosi, and my self, to proceed to those more particular things, that directly tend to the main scope of our epistle.

THE first advantage, that our experimental philosopher, as such, hath towards being a Christian, is, that his course of studies conduceth much to settle in his mind a firm belief of the existence, and divers of the chief attributes, of God: which belief is, in the order of things, the first principle of that natural religion, which it self is pre-required to revealed religion in general, and consequently to that in particular, which is embraced by Christians.

THAT the consideration of the vastness, beauty, and regular motions, of the heavenly bodies; the excellent structure of animals and plants; besides a multitude of other phænomena of nature, and the subserviency of most of these to man; may justly induce him, as a rational creature, to conclude, that this vast, beautiful, orderly, and (in a word) many ways admirable system of things, that we call the world, was framed by an author supremely powerful, wise, and good, can scarce be denied by an intelligent and unprejudiced considerer. And this is strongly confirmed by experience, which witnesseth, that in almost all ages and countries, the generality of philosophers, and contemplative men, were persuaded of the existence of a deity, by the consideration of the phænomena of the universe; whose fabrick and conduct they rationally concluded could not be deservedly ascribed, either to blind chance, or to any other cause than a divine being.

BUT though it be true, that "God hath "not left himself without witness," even to perfunctory considerers, by stamping upon divers of the more obvious parts of his workmanship such conspicuous impressions of his attributes, that a moderate degree of understanding, and attention, may suffice to make men acknowledge his being: yet I scruple not to think that assent very much inferior to the belief, that the same objects are fitted to produce in an heedful and intelligent contemplator of them. For the works of God are so worthy of their author, that besides the impresses of his wisdom and goodness, that are left as it were upon their surfaces, there are a great many more curious and excellent tokens and effects of divine artifice, in the hidden and innermost recesses of them; and these are not to be discovered by the perfunctory looks of oscitant or unskilful beholders; but require, as well as deserve, the most attentive and prying inspection of inquisitive and well-instructed considerers. And sometimes in one creature there may be I know not how many admirable things, that escape a vulgar eye, and yet may be clearly discerned by that of a true naturalist; who brings with him, besides a more than common curiosity and attention, a competent knowledge of anatomy, opticks, cosmography, mechanicks, and chemistry. But treating elsewhere purposely of this

this ſubject, it may here ſuffice to ſay, that God has couched ſo many things in his viſible works, that the clearer light a man has, the more he may diſcover of their unobvious exquiſiteneſs, and the more clearly and diſtinctly he may diſcern thoſe qualities, that lie more obvious. And the more wonderful things he diſcovers in the works of nature, the more auxiliary proofs he meets with to eſtabliſh and enforce the argument, drawn from the univerſe and its parts, to evince that there is a God: which is a propoſition of that vaſt weight and importance, that it ought to endear every thing to us, that is able to confirm it, and afford us new motives to acknowledge and adore the divine author of things.

IN reference to this matter, we may confidently ſay, that the experimental philoſophy has a great advantage of the ſcholaſtick. For in the peripatetick ſchools, where things are wont to be aſcribed to certain ſubſtantial forms and real qualities; (the former of which are acknowledged to be very abſtruſe and myſterious things, and the latter are many of them confeſſedly occult;) the accounts of nature's works may be eaſily given in a few words, that are general enough to be applicable to almoſt all occaſions. But theſe uninſtructive terms do neither oblige nor conduct a man to deeper ſearches into the ſtructure of things, nor the manner of being produced, and of operating upon one another. And conſequently are very inſufficient to diſcloſe the exquiſite wiſdom, which the omniſcient maker has expreſſed in the peculiar fabricks of bodies, and the ſkilfully regulated motions of them, or of their conſtituent parts: from the diſcernment of which things nevertheleſs it is, that there is, by way of reſult, produced in the mind of an intelligent contemplator a ſtrong conviction of the being of a divine opificer, and a juſt acknowledgment of his admirable wiſdom. To be told, that an eye is the organ of ſight, and that this is performed by that faculty of the mind, which from its function is called viſive, will give a man but a ſorry account of the inſtruments and manner of viſion itſelf, or of the knowledge of that opificer, who, as the Scripture ſpeaks, "formed the eye." And he that can take up with this eaſy theory of viſion, will not think it neceſſary to take the pains to diſſect the eyes of animals, nor ſtudy the books of mathematicians, to underſtand viſion; and accordingly will have but mean thoughts of the contrivance of the organ, and the ſkill of the artificer, in compariſon of the ideas, that will be ſuggeſted of both of them to him, that being profoundly ſkilled in anatomy and opticks, by their help takes aſunder the ſeveral coats, humours, and muſcles, of which that exquiſite dioptrical inſtrument conſiſts: and having ſeparately conſidered the figure, ſize, conſiſtence, texture, diaphaneity, or opacity, ſituation, and connexions of each of them, and their coaptation in the whole eye, ſhall diſcover, by the help of the laws of opticks, how admirably this little organ is fitted to receive the incident beams of light, and diſpoſe them in the beſt manner poſſible for completing the lively repreſentation of the almoſt infinitely various objects of ſight.

Pſal. xciv. 9.

IT is eaſy for men to ſay in general terms, that the word is wiſely framed; but I doubt it often happens, that men confeſs, that the creatures are wiſely made, rather becauſe upon other grounds they believe God to be a wiſe agent, than becauſe ſo ſlight an account, as the ſchool philoſophy gives of particular creatures, convinces them of any divine wiſdom in the Creator. And though I am willing to grant, that ſome impreſſions of God's wiſdom are ſo conſpicuous, that (as I lately intimated) even a ſuperficial philoſopher may thence infer, that the author of ſuch works muſt be a wiſe agent; yet how wiſe an agent he has in thoſe works expreſſed himſelf to be, none but an experimental philoſopher can well diſcern. And it is not by a ſlight ſurvey, but by a diligent and ſkilful ſcrutiny of the works of God, that a man muſt be, by a rational and affective conviction, engaged to acknowledge with the prophet, that the author of nature is "wonderful in counſel, and excellent in working," Iſa. xxviii. 29.

II. AFTER the exiſtence of the deity, the next grand principle of natural religion, is the immortality of the rational ſoul; whoſe genuine conſequence is, the belief and expectation of a future and everlaſting ſtate. For this important truth, divers arguments may be alledged, that may perſuade a ſober and well-diſpoſed man to embrace it: but to convince a learned adverſary, the ſtrongeſt argument, that the light of nature ſupplies us with, ſeems to be that, which is afforded by the real philoſophy. For this teacheth us to form true and diſtinct notions of the body, and the mind; and thereby manifeſts ſo great a difference in their eſſential attributes, that the ſame thing cannot be both. This it makes out more diſtinctly, by enumerating ſeveral faculties and functions of the rational ſoul; ſuch as to underſtand, and that ſo, as to form conceptions of abſtracted things, of univerſals, of immaterial ſpirits, and even of that infinitely perfect one, God himſelf: and alſo to conceive, and demonſtrate, that there are incommenſurable lines, and ſurd numbers; to make ratiocinations, and both cogent and concatenated inferences, about theſe things; to expreſs their intellectual notions, *pro re natâ*, by words or inſtituted ſigns to other men; to exerciſe free-will about many things; and to make reflections on its own acts, both of intellect and will. For theſe and the like prerogatives, that are peculiar to the human mind, and ſuperior to any thing, that belongs to the outward ſenſes, or to the imagination itſelf, manifeſt, that the rational ſoul is a being of an higher order than corporeal; and conſequently, that the ſeat of theſe ſpiritual faculties, and the ſource of theſe operations, is a ſubſtance, that being in its own nature diſtinct from the body, is not naturally ſubject to die or periſh with it.

AND in reference to this truth, our virtuoſo hath an advantage of a mere ſchool-philoſopher. For being acquainted with the true and real cauſes of putrefaction, and other phyſical kinds of corruption; and thereby diſcerning, that the things, that deſtroy bodies, are the avolation, or other receſs of ſome neceſſary parts, and ſuch a depraving tranſpoſition of the component portions of matter, as is altogether incongruous to the ſtructure and mechanical modification, that is eſſential to a body of that ſpecies or kind it belongs to: our naturaliſt, I ſay, knowing this, plainly perceives, that theſe cauſes of deſtruction can have no place in the rational ſoul; which being an immaterial ſpirit, and conſequently a ſubſtance not really diviſible, can have no parts expelled or tranſpoſed, and ſo being exempted from the phyſical cauſes of corruption that deſtroys bodies, ſhe ought to laſt always. And being a rational creature, endowed with internal principles of acting, as appears in free-will, ſhe ought to live for ever, unleſs it pleaſe God to annihilate her; which we have no reaſon to ſuppoſe he will do. But on the other ſide, the modern peripateticks (for I queſtion, whether *Ariſtotle* himſelf were of the ſame opinion) maintain ſubſtantial forms, by ſome of them ſtiled *ſemi ſubſtantiæ*, to which in apes, elephants, and others, that paſs for ingenious animals, they aſcribe ſome ſuch faculties and functions, as ſeem to differ but gradually from thoſe of the rational ſoul; and (how innocent ſoever I grant their intentions to be) their doctrine tends much to enervate, if not quite to diſable the chief phyſical way of probation, whence the immortality of man's mind is juſtly inferred. For ſince according to the peripateticks, ſubſtantial forms are, as they ſpeak, enduced out of the power or potentiality of the matter; and do ſo depend upon it, not only as to action, but as to being, that they cannot at all ſubſiſt without it; but when the particular body (as an herb, a ſtone, or a bird) is deſtroyed, they periſh with it, or (as ſome of them ſcarce intelligibly expreſs the ſame thing) fall back into the boſom of the matter: I think they give great advantage to atheiſts and cavillers, to impugn the mind's immortality.

FOR if to an ape, or other brute animal, there belongs a being more noble than matter, that can actuate and inform it, and make itſelf the architect of its own manſion, though ſo admirable as that of an ape, or an elephant; if this being can in the body it hath framed, perform all the functions of a vegetable ſoul; and beſides thoſe, ſee, hear, taſte, ſmell, imagine, infer, remember, love, hate, fear, hope, expect, *&c.* and yet be a mortal thing, and periſh with the body; it will not be difficult for thoſe enemies of religion, who are willing to think the ſoul mortal, becauſe their brutiſh lives make them wiſh ſhe were, to fancy, that human minds are but a ſomewhat more noble, but not for that leſs mortal kind of ſubſtantial forms, as amongſt ſenſitive ſouls themſelves, which they acknowledge to be equally mortal, there is a great diſparity in degrees, that of a monkey, for inſtance, being very far ſuperior to that of an oiſter.

III. THE third main principle of unrevealed religion, and conſequently of revealed, (which preſuppoſes natural religion, as its foundation) is a belief of the divine providence. And in this grand article, as well as in the two foregoing, a man may be much confirmed by experimental philoſophy, both as it affords him poſitive inducements to acknowledge the article, and as it ſhews the great improbability of the two main grounds, on one or other of which (for they are not well conſiſtent) is founded the denial of God's providence.

A VIRTUOSO, that by manifold and curious experiments ſearches deep into the nature of things, has great and peculiar advantages to diſcover and obſerve the excellent fabrick of the world, as it is an immenſe aggregate of the ſeveral creatures that compoſe it; and to take notice in its particular parts, eſpecially thoſe that are animated, of ſuch exquiſite contrivances, and ſuch admirable co-ordinations, and ſubordinations, in reference to each other, as lye hid from thoſe beholders, that are not both attentive and ſkilful. When our virtuoſo contemplates the vaſtneſs, ſcarce conceivable ſwiftneſs, and yet conſtant regularity of the various motions of the ſun, moon, and other celeſtial lights; when he conſiders, how the magnetiſm of the earth makes its poles conſtantly look the ſame way, notwithſtanding the motions of its fluid vortex; how by daily turning about its own center in four and twenty hours, it receives as much light, and benefit from the ſun, and all the glorious conſtellations of the firmament, as if they, with all the vaſt heavenly region they belong to, moved about it in the ſame time; how by its ſituation among them it enjoys the regular viciſſitudes of day and night, ſummer and winter, *&c.* how the ſeveral parts of the ſublunary world are mutually ſubſervient to one another, and moſt of them (one way or other) ſerviceable to man; how excellently the bodies of animals are contrived; what various and congruous proviſion is made for differing animals, that they may ſubſiſt as long as they ſhould, according to the inſtitution of nature, by furniſhing them, according to their reſpective natures, ſome with ſtrength to take their food by force, others with induſtry to procure it by ſubtilty, ſome with arms, as horns, hoofs, ſcales, tuſks, poiſons, ſtings, *&c.* to defend themſelves, and offend their enemies; ſome with wings or ſwiftneſs to fly from dangers; ſome with foreſight to prevent them; ſome with craft, and perhaps ſtrange fetches of it to elude them; how being diſtinguiſhed into two ſexes, each of theſe is furniſhed with appoſite organs for the propagation of the ſpecies, and with ſkill and kindneſs to nouriſh and train up their young ones, till they can ſhift for themſelves; how admirable, and indeed aſtoniſhing, a proceſs is gone through in the formation of the fœtus, eſpecially of a human one; how divers animals are endowed

dowed with ſtrange inſtincts, whoſe effects ſometimes ſeem much to ſurpaſs thoſe of reaſon itſelf; though they are ſuperadded to the mechanical ſtructure of the animal, and argue a reſpect to things very remote from it, either in time, place, or both, and perhaps alſo to the grand fabrick or ſyſtem of the world, and the general oeconomy of nature. When, as I was ſaying, a philoſopher duly reflects on theſe things, and many others of the like import, he will think it highly rational to infer from them theſe three concluſions.

FIRST, that a machine ſo immenſe, ſo beautiful, ſo well contrived, and, in a word, ſo admirable as the world, cannot have been the effect of mere chance, or the tumultuous juſtlings and fortuitous concourſe of atoms, but muſt have been produced by a cauſe exceedingly powerful, wiſe, and beneficent.

SECONDLY, that this moſt potent author, and (if I may ſo ſpeak) opificer of the world, hath not abandoned a maſterpiece ſo worthy of him, but does ſtill maintain and preſerve it, ſo regulating the ſtupendiouſly ſwift motions of the great globes, and other vaſt maſſes of the mundane matter, that they do not, by any notable irregularity, diſorder the grand ſyſtem of the univerſe, and reduce it to a kind of chaos, or confuſed ſtate of ſhuffled and depraved things.

THIRDLY, that as it is not above the ability of the divine author of things, though a ſingle being, to preſerve and govern all his viſible works, how great and numerous ſoever; ſo he thinks it not below his dignity and majeſty, to extend his care and beneficence to particular bodies, and even to the meaneſt creatures; providing not only for the nouriſhment, but for the propagation of ſpiders and ants themſelves. And indeed, ſince the truth of this aſſertion, that God governs the world he has made, would appear (if it did not by other proofs) by the conſtancy and regularity, and aſtoniſhing rapid motions of the vaſt celeſtial bodies, and by the long trains of as admirable as neceſſary artifices, that are employed to the propagation of various ſorts of animals, whether viviparous, or oviparous; I ſee not, why it ſhould be denied, that God's providence may reach to his particular works here below, eſpecially to the nobleſt of them, man; ſince moſt of thoſe learned men, that deny this, as derogatory to God's majeſty and happineſs, acknowledge, that at the firſt creation, or (if they diſlike that term) formation of things, the great author of them muſt not only have extended his care to the grand ſyſtem of the univerſe in general, but allowed it to deſcend ſo low, as to contrive all the minute and various parts, (and even the moſt homely ones) not only of greater and (reputedly) more perfect animals, as elephants, whales, and men; but ſuch ſmall and abject ones, as flies, ants, fleas, *&c.* which being manifeſtly propagated by eggs laid by the female, cannot reaſonably be thought the off-ſpring of putrefaction. Whence I gather, as from matter of fact, that to be concerned for the welfare, even of particular animals, as it is agreeable to God's all-pervading wiſdom, and exuberant beneficence; ſo (whatever men's vanity may make them ſurmiſe) it is not truly derogatory to his adorable greatneſs and majeſty.

AND on this occaſion, I ſhall add, that ſince man is the nobleſt of God's viſible works; ſince very many of them ſeem made for his uſe; ſince, even as an animal, he is (as the Pſalmiſt truly ſpeaks) "wonderfully made," and curiouſly or artificially wrought; and ſince God has both given him a rational mind, and endowed it with an intellect, whereby he can contemplate the works of nature, and by them acquire a conviction of the exiſtence, and divers attributes, of their ſupremely perfect author; ſince God hath planted notions and principles in the mind of man, fit to make him ſenſible, that he ought to adore God, as the moſt perfect of beings, the ſupreme lord and governor of the world, the author of his own nature, and all his enjoyments; ſince all this, I ſay, is ſo, natural reaſon dictates to him, that he ought to expreſs the ſentiments he has for this divine being, by veneration of his excellencies; by gratitude for his benefits; by humiliation, in view of his greatneſs and majeſty; by an awe of his juſtice; by reliance on his power and goodneſs, when he duly endeavours to ſerve and pleaſe him; and, in ſhort, by thoſe ſeveral acts of natural religion, that reaſon ſhews to be ſuitable, and therefore due to thoſe ſeveral divine attributes of his, which it has led us to the knowledge of. Pſalm cxxxviii. 14, 15.

AND here I ſhall take leave to add, that, from the Carteſian principles (which you know are embraced by a great part of the modern virtuoſi) I think, I may draw a double argument for divine providence.

FOR firſt, according to the Carteſians, all local motion (which is, under God, the grand principle of all actions among things corporeal) is adventitious to matter, and was at firſt produced in it, and is ſtill every moment continued and preſerved immediately by God: whence may be inferred, that he concurs to the actions of each particular agent (as they are phyſical) and conſequently, that his providence reaches to all and every one of them,

AND ſecondly, the ſame Carteſians believe the rational ſoul to be an immaterial ſubſtance, really diſtinct and ſeparable from the body. Whence I infer, that the divine providence extends to every particular man; ſince whenever an embryo, or little human body formed in the womb, is, by being duly organiſed, fitted to receive a rational mind, God is pleaſed to create one, and unite it with that body. In which tranſaction, there ſeems to me a neceſſity of a direct and particular intervention of the divine power; ſince I underſtand not, by what phyſical charm or ſpell an immaterial ſubſtance can be allured into this or that particular embryo, of many that are at the ſame time fitted to receive a human ſoul; nor by what merely mechanical tie, or band, an immaterial ſubſtance can be ſo durably (perhaps for 80 or 100 years) joined and united with a corporeal, in which it finds no parts, that it has organs to take hold of, and to which it

can furniſh no parts to be faſtened upon by them. Nor do I better conceive, how a mere body can produce pain, pleaſure, *&c.* by its own mere action, or rather endeavour to act, on an immaterial ſpirit. Nor will the force of all that has been ſaid for God's ſpecial providence, be eluded, by ſaying, with ſome deiſts, that after the firſt formation of the univerſe, all things are brought to paſs by the ſettled laws of nature. For though this be confidently, and not without colour pretended; yet, I confeſs, it does not ſatisfy me. For, beſide the inſuperable difficulty there is, to give an account of the firſt formation of things, which many (eſpecially Ariſtotelian) deiſts will not aſcribe to God; and beſides that the laws of motion, without which the preſent ſtate and courſe of things could not be maintained, did not neceſſarily ſpring from the nature of matter, but depended upon the will of the divine author of things: beſides this, I ſay, I look upon a law as a moral, not a phyſical cauſe, as being indeed but a notional thing, according to which, an intelligent and free agent is bound to regulate its actions. But inanimate bodies are utterly incapable of underſtanding what a law is, or what it enjoins, or when they act conformably or unconformably to it; and therefore the actions of inanimate bodies, which cannot incite or moderate their own actions, are produced by real power, not by laws; though the agents, if intelligent, may regulate the exertions of their power by ſettled rules.

IV. I HAVE taken notice of two other accounts, upon which the experimental knowledge of God's works may, in a well-diſpoſed mind, conduce to eſtabliſh the belief of his providence; and therefore, though I ſhall not dwell long upon them, I muſt not altogether pretermit them.

FIRST then, when our virtuoſo ſees how many, and how various, and oftentimes how ſtrange, and how admirable ſtructures, inſtincts, and other artifices, the wiſe opificer hath furniſhed even brutes and plants withal, to purchaſe and aſſimilate their food, to defend or otherwiſe ſecure themſelves from hoſtile things, and (to be ſhort) to maintain their lives, and propagate their ſpecies; it will very much conduce to perſuade him, that ſo wiſe an agent, who has at command ſo many differing and excellent methods and tools, to accompliſh what he deſigns, and does oftentimes actually employ them, for the preſervation and welfare of beaſts, and even of plants, can never want means to compaſs his moſt wiſe and juſt ends, in relation to mankind; being able, by ways that we ſhould never dream of, to execute his menaces, and fulfil his promiſes. But of theſe rare ſtructures, inſtincts, and other methods, and, if I may ſo ſtile ſome of them with reverence, ſtratagems and fetches of divine ſkill, that God is pleaſed to employ in the conduct of the viſible world, eſpecially animals, I have already elſewhere purpoſely diſcourſed; and therefore ſhall now proceed, and obſerve, in the ſecond place, that, when we duly conſider the very differing ends, to which many of God's particular works, eſpecially thoſe that are animated, ſeem deſigned, in reference both to their own welfare, and the utility of man; and with how much wiſdom, and, I had almoſt ſaid, care, the glorious Creator has been pleaſed to ſupply them with means admirably fit for the attainment of theſe reſpective ends; we cannot but think it highly probable, that ſo wiſe, and ſo benign a being has not left his nobleſt viſible creature, man, unfurniſhed with means to procure his own welfare, and obtain his true end, if he be not culpably wanting to himſelf. And ſince man is endowed with reaſon, which may convince him (of what neither a plant, nor brute animal is capable of knowing, namely) that God is both his maker, and his continual benefactor; ſince his reaſon likewiſe teacheth him, that upon both thoſe accounts, beſides others, God may juſtly expect and require worſhip and obedience from him; ſince alſo the ſame rational faculty may perſuade him, that it may well become the majeſty and wiſdom of God, as the ſovereign rector of the world, to give a law to man, who is a rational creature, capable of underſtanding and obeying it, and thereby glorifying the author of it; ſince (farthermore) finding in his own mind (if it be not depraved by vice, or luſts) a principle, that dictates to him, that he owes a veneration, and other ſuitable ſentiments, to the divinely excellent author of his being, and his continual and munificent benefactor; ſince, on theſe ſcores, his conſcience will convince him of his obligation to all the eſſential duties of natural religion; and ſince, laſtly, his reaſon may convince him, that his ſoul is immortal, and is therefore capable, as well as deſirous, to be everlaſtingly happy, after it has left the body; he muſt in reaſon be ſtrongly inclined to wiſh for a ſupernatural diſcovery of what God would have him believe and do. And therefore if, being thus prepared, he ſhall be very credibly informed, that God hath actually been pleaſed to diſcover by ſupernatural revelation (what, by reaſon, without it, he can either not at all, or but rovingly, gueſs at) what kind of worſhip and obedience will be moſt acceptable to him; and to encourage man to both theſe, by explicit promiſes of that felicity, that man, without them, can but faintly hope for; he would be ready then thankfully to acknowledge, that this way of proceeding beſeems the tranſcendent goodneſs of God, without derogating from his majeſty and wiſdom. And by theſe and the like reflections, whereof ſome were formerly intimated, a philoſopher, that takes notice of the wonderful providence, that God deſcends to exerciſe for the welfare of inferior and irrational creatures, will have an advantage above men not verſed in the works and courſe of nature, to believe, upon the hiſtorical and other proofs, that Chriſtianity offers, that God has actually vouchſafed to man, his nobleſt, and only rational viſible creature, an explicit and poſitive law, enforced by threatning ſevere penalties to the ſtubborn tranſgreſſors; and promiſing

promiſing to the ſincere obeyers rewards ſuitable to his own greatneſs and goodneſs. And thus the conſideration of God's providence, in the conduct of things corporeal, may prove, to a well diſpoſed contemplator, a bridge, whereon he may paſs from natural to revealed religion.

I HAVE been the more particular and expreſs, in what I have ſaid about divine providence, becauſe I did not find other writers had made it needleſs for me to do ſo. And I dwelt the longer upon the exiſtence of the deity, and the immortality of the ſoul, that I might let you ſee, that I did not ſpeak groundleſly, or raſhly, but, that I had conſidered what I ſaid, when I aſſerted, that the experimental philoſophy might afford a well-diſpoſed mind conſiderable helps to natural religion. I find my ſelf therefore now at liberty to proceed to farther conſiderations, and repreſent to you, that,

V. ANOTHER thing, that diſpoſes an experimentarian philoſopher to embrace religion, is, that his genius and courſe of ſtudies accuſtoms him to value and delight in abſtracted truths; by which term, I here mean ſuch truths, as do not at all, or do but very little, gratify mens ambition, ſenſuality, or other inferior paſſions and appetites. For, whereas the generality of thoſe, that are averſe from religion, are enclined to be ſo, upon this account (among others) that they have a contempt or undervaluation of all truths, that do not gratify their paſſions or intereſts; he, that is addicted to knowledge experimental, is accuſtomed both to purſue, eſteem and reliſh many truths, that do not delight his ſenſes, or gratify his paſſions, or his intereſts, but only entertain his underſtanding with that manly and ſpiritual ſatisfaction, that is naturally afforded it by the attainment of clear and noble truths, which are its genuine objects and delights. And though I grant, that the diſcoveries made by the help of phyſical or mechanical experiments are not, for the moſt part, of kin to religion; yet, beſides that ſome of them do manifeſtly conduce to eſtabliſh or illuſtrate natural theology, which is that (as, though noted already, deſerves to be inculcated) which revealed religion, and conſequently, that of Chriſtians, muſt be founded on, or muſt ſuppoſe: beſides this, I ſay, we may argue *à fortiori*, that he, that is accuſtomed to prize truths of an inferior kind, becauſe they are truths, will be much more diſpoſed to value divine truths, which are of a much higher and nobler order, and of an ineſtimable and eternal advantage.

VI. THERE is another thing, that is too pertinent to the main ſcope of this diſcourſe to be here pretermitted: and it is, that both the temper of mind, that makes a man moſt proper to be a virtuoſo, and the way of philoſophiſing he chiefly employs, conduce much to give him a ſufficient, and yet well grounded and duly limited docility, which is a great diſpoſition to the entertainment of revealed religion. In the vulgar and ſuperficial philoſophy, wherein a man is allowed to think, that he has done his part well enough, when he has aſcribed things to a ſubſtantial form, or to nature, or to ſome real quality, whether manifeſt or occult, without proving, that there are ſuch cauſes, or intelligibly declaring, how they produce the phænomena, or effects referred to them; in this philoſophy, I ſay, it is eaſy for a man to have a great opinion of his own knowledge, and be puffed up by it. But a virtuoſo, that cannot ſatisfy himſelf, nor dares pretend to ſatisfy others, till he can by hypotheſes, that may be underſtood and proved, declare intelligibly the manner of the operation of the cauſes he aſſigns, will often find it ſo difficult a taſk to do ſo, that he will eaſily diſcern, that he needs further information, and therefore ought to ſeek for it where it is the moſt likely to be had; and not only to admit, but welcome it if he finds it. Beſides, the litigious philoſophy of the ſchools ſeldom furniſhes its diſciples with better than dialectical or probable arguments, which are not proper, either fully to ſatisfy the perſon that employs them, or leave his adverſary without any anſwer, plauſible at leaſt, if not full as probable as the objection, upon which account, men, that have more wit than ſincere love of truth, will be able to diſpute ſpeciouſly enough, as long as they have a mind to do ſo. And as ſuch ſlippery arguments are not able to convince even him that employs them, if he be a man of judgment; ſo if he deals with a witty adverſary, they will leave him to elude any arguments of the like nature, with which he ſhall be preſſed. And in effect we ſee, that in the Ariſtotelian philoſophy there are divers queſtions, ſuch as, whether the elements retain their diſtinct nature in a mixed body? Whether the celeſtial orbs are moved by intelligences? To omit many others, which are as it were ſtated queſtions; and as they have been diſputed from age to age, are like to continue queſtions for many more, if that philoſophy laſt ſo long. But a virtuoſo, that is wont in his reaſonings to attend to the principles of mathematicks, and ſound philoſophy, and to the clear teſtimonies of ſenſe, or well verified experiments, acquires a habit of diſcerning the cogency of an argument, or way of probation, and eaſily diſcerns, that dialectical ſubtilties and ſchool tricks cannot ſhift off its force, but finds more ſatisfaction in embracing a demonſtrated truth, than in the vain glory of diſputing ſubtilly againſt it.

VII. ANOTHER thing, that may diſpoſe a ſtudious ſearcher of truth, (not by ſpeculations only, but) by experiments, for theology, is, that his inquiſitiveneſs, and courſe of ſtudies, makes him both willing and fit to ſearch out and diſcover deep and unobvious truths. I have with trouble obſerved, that the greater part of the libertines we have among us, being men of *Pilate*'s humour, (who, when he had ſcornfully aſked what is truth? would not ſtay for an anſwer) do with great faſtidiouſneſs decline the ſtudy of all truths, that require a ſerious and ſettled application of mind. Theſe men are, for the moſt part, a ſort

ſort of ſuperficial and deſultory wits, that go no further than the outſide of things, without penetrating into the receſſes of them; and being eaſily tired with contemplating one, paſs quickly to another; the conſideration whereof they with the ſame lightneſs forſake. And upon this account, among others, it is, that this ſort of men, though often much applauded by others, becauſe the moſt are but ſuperficial, as well as they, do almoſt as ſeldom make good philoſophers, as good Chriſtians. For though all the good arguments, that may be brought to evince the truth of natural (and revealed) religion, be not abſtruſe; yet ſome of the chief ones, eſpecially thoſe, that prove the exiſtence and ſpecial providence of God, and the ſoul's immortality, are, if not of a metaphyſical, yet at leaſt of a philoſophical nature; and will ſcarce be clearly underſtood, and duly reliſhed, but by a perſon capable of, and ſomewhat accuſtomed to attentive and laſting ſpeculations, (as in another paper has been more fully declared.) But now, a man addicted to proſecute diſcoveries of truths, not only by ſerious meditation, but by intricate and laborious experiments, will not eaſily be deterred from effectually proſecuting his end, by the troubleſomneſs or difficulties that attend the clearing of thoſe notions, and matters of fact, whereon ſolid arguments for natural or revealed religion are founded; how remote ſoever thoſe truths may be from vulgar apprehenſions. In ſhort, whereas a ſuperficial wit, ſuch as is frequently found in libertines, and often helps to make them ſuch, may be compared to an ordinary ſwimmer, who can reach but ſuch things as float upon the water; an experimental philoſopher may be compared to a ſkilful diver, that cannot only fetch thoſe things, that lie upon the ſurface of the ſea, but make his way to the very bottom of it, and thence fetch up pearls, corals, and other precious things, that in thoſe depths lie concealed from other men's ſight and reach.

About ſome cauſes of atheiſm.

WE have already ſeen, that experimental philoſophy is, in its own nature, friendly to religion in general.

WHEREFORE I ſhall now add, that the reverence I pay experience, eſpecially as it gives both grounds and hints to rational notions and concluſions, does not a little conduce to the aſſent I give to the truth of the Chriſtian religion in particular.

THIS excellent religion is recommended to well diſpoſed minds by a greater number of prerogatives, and other arguments, than it were proper for me to inſiſt on in this diſcourſe: and yet my deſign engages me to conſider a few of them ſomewhat particularly.

AND firſt, I ſhall obſerve, that whereas the three grand arguments, that jointly evince the truth of the Chriſtian religion in general, are (at leaſt in my opinion) the excellency of the doctrine, which makes it worthy to have proceeded from God; the teſtimony of the divine miracles, that were wrought to recommend it; the great effects produced in the world by it; two of theſe three arguments (for the firſt is of a more ſpeculative nature) are bottomed upon matters of fact, and conſequently are likely to be the moſt prevalent upon thoſe, that have a great veneration for experience, and are duly diſpoſed to frame ſuch pious reflections, as it warrants and leads them to make. This laſt clauſe I add, becauſe, though I have formerly more than intimated ſomething of the like import, yet it is ſo neceſſary to my deſign, that you ſhould take ſpecial notice of it, that I muſt not here omit to advertiſe you, that when, in this diſcourſe, I ſpeak of an experimental philoſopher, or virtuoſo; I do not mean, either on this hand, a libertine, though ingenious, or a ſenſualiſt, though curious; or on that hand, a mere empirick, or ſome vulgar chemiſt, that looks upon nothing as experimental, wherein chemiſtry, mechanicks, *&c.* are not employed; and who too often makes experiments, without making reflection on them, as having it more in his aim to produce effects, than to diſcover truths. But the perſon I here mean, is ſuch a one, as by attentively looking about him, gathers experience, not from his own trials alone, but from divers other matters of fact, which he heedfully obſerves, though he had no ſhare in the effecting them; and on which he is diſpoſed to make ſuch reflections, as may (unforcedly) be applied to confirm and encreaſe in him the ſentiments of natural religion, and facilitate his ſubmiſſion and adherence to the Chriſtian religion.

AN experimental philoſopher thus diſpoſed will, with the divine aſſiſtance, (which he will be careful to implore) find pregnant motives to the belief of Chriſtianity, in the two laſt of the three arguments of its truth, that I lately propoſed. That which is drawn from the effects of this religion in the world, as it is laſt named, ſo I ſhall defer the conſideration of it, till I have treated of the other, namely, the teſtimony of divine miracles, whoſe difficulty makes it requiſite for us to conſider it the more attentively, and diſtinctly declare the grounds, upon which experience may be eſteemed a good topick on the preſent occaſion. For the clearing of this matter, I ſhall repreſent to you, that the word experience may admit of divers ſenſes, whereof one is far more comprehenſive than another, and likewiſe of ſeveral diviſions and diſtributions. For beſides its more reſtrained acceptation, it is ſometimes ſet in contradiſtinction to reaſon, ſo as to comprehend, not only thoſe phænomena, that nature or art exhibits to our outward ſenſes, but thoſe things, that we perceive to paſs within ourſelves; and all thoſe ways of information, whereby we attain any knowledge that we do not owe to abſtracted reaſon. So that, without ſtretching the word to the utmoſt extent of which it is capable, and to which it has been enlarged; it may be looked upon as ſo comprehenſive a term, that I think it may be of ſome importance to my preſent deſign, and perhaps to theology itſelf, to propoſe to you a diſtribution of experience, that will not,

not, I hope, be found uſeleſs to clear the extent of that term. I ſhall then take the freedom to enlarge the ſignification of the word beyond its commoneſt limits, and divide it, for diſtinction's ſake, into immediate and vicarious experience; or rather ſomewhat leſs compendiouſly, but perhaps more commodiouſly, into perſonal, hiſtorical, and ſupernatural, (which may be alſo ſtiled theological;) referring the firſt of the three members of this diſtribution to immediate experience, and the two others to vicarious.

I CALL that perſonal experience, which a man acquires immediately by himſelf, and accrues to him by his own ſenſations, or the exerciſe of his faculties, without the intervention of any external teſtimony. It is by this experience, that we know, that the ſun is bright; fire hot; ſnow cold and white; that upon the want of aliments we feel hunger; that we hope for future goods; that we love what we judge good, and hate what we think evil; and diſcern, that there is a great difference between a triangle and a circle, and can diſtinguiſh them by it.

BY hiſtorical experience I mean that, which, though it were perſonal in ſome other man, is but by his relation or teſtimony, whether immediately or mediately, conveyed to us. It is by this, that we know, that there were ſuch men as *Julius Cæſar*, and *William the Conqueror*, and that *Joſeph* knew, that *Pharoah* had a dream, which the Egyptian wiſe men could not expound.

BY theological experience I mean that, by which we know, what, ſuppoſing there is ſome divine revelation, God is pleaſed to relate or declare concerning himſelf, his attributes, his actions, his will, or his purpoſes, whether immediately, (or without the intervention of man) as he ſometimes did to *Job* and *Moſes*, and conſtantly to Chriſt our Saviour: or by the intervention of angels, prophets, apoſtles, or inſpired perſons, as he did to the Iſraelites, and the primitive Chriſtian church; and does ſtill to us, by thoſe written teſtimonies we call the Scriptures.

BY perſonal experience we know, that there are ſtars in heaven; by hiſtorical experience we know, that there was a new ſtar ſeen by *Tycho* and other aſtronomers in *Caſſiopæa*, in the year 1572. and by theological experience we know, that the ſtars were made on the fourth day of the creation.

BY this you may ſee, that I do not in this diſcourſe take experience in the ſtricteſt ſenſe of all, but in a greater latitude, for the knowledge we have of any matter of fact, which, without owing it to ratiocination, either we acquire by the immediate teſtimony of our own ſenſes and other faculties, or accrues to us by the communicated teſtimony of others. And I make the leſs ſcruple to take this liberty, becauſe I obſerve, that even in common acceptation, the word experience is not always meant of that which is immediate, but is often taken in a latitude. As when we ſay, that experience teaches us, who perhaps were never out of *England*, that the torrid zone is habitable and inhabited; and perſuades learned men, that never had opportunity to make nice celeſtial obſervations, that ſtars may be generated and periſh, or at leaſt begin to appear, and then diſappear in the celeſtial region of the world. And on this kind of hiſtorical experience, conſiſting of the perſonal obſervations of *Hippocrates*, *Galen*, and other phyſicians, tranſmitted to us, a great part of the practice of phyſick is founded. And the moſt rational phyſicians reckon upon, as matters of fact, not only what other phyſicians have left upon record, but divers preſent things, which themſelves can know but by the relation of their patients; as that a man has a particular antipathy to ſuch a thing, which the doctor perhaps judges fit for him to uſe; or that a woman with child longs for this or that determinate thing. And phyſicians reduce theſe and the like matters of fact to experience, as to one of the two columns of phyſick diſtinguiſhed from reaſon.

SINCE then learned men, as well as common uſe, confine not the appearance of the word experience to that which is perſonal, but employ it in a far greater latitude, I ſee not, why that, which I call theological experience, may not be admitted; ſince the revelations, that God makes concerning what he has done, or purpoſes to do, are but teſtimonies of things, moſt of them matters of fact, and all of them ſuch, as ſo far forth as they are merely revelations, cannot be known by reaſoning, but by teſtimony: whoſe being divine, and relating to theological ſubjects, does not alter its nature, though it give it a peculiar and ſupereminent authority.

HAVING premiſed and cleared the propoſed diſtribution of experience, it will now be ſeaſonable to conſider, how it may be applied to the matters of fact, that recommend the credibility of the Chriſtian religion; and on this occaſion I ſhall diſtinctly offer you my thoughts in the two following propoſitions.

PROP. I. "We ought to believe divers "things upon the information of experience, "(whether immediate, or vicarious) which, "without that information, we ſhould judge "unfit to be believed, or antecedently to it "did actually judge contrary to reaſon."

THIS propoſition may be underſtood, either of perſons, or of things, and will hold true as to both.

AND firſt, as to perſons; if your own obſervation of what occurs among mankind do not ſatisfy you, that we are obliged, after ſufficient trial, frequently to alter the opinions, which upon probable reaſons we had before entertained, of the fidelity, or prudence, or juſtice, or chaſtity, *&c.* of this or that perſon; I ſhall refer you to the records of hiſtory, or appeal to the tribunals of judges. For both in the one, and at the other, you will find but too many inſtances and proofs from matters of fact, that perſons looked on, even by intelligent men, as honeſt, virtuous,

and perhaps holy too, have proved guilty of falſeneſs to their friends, perfidiouſneſs to their princes, diſloyalty to their huſbands or wives, injuſtice to their neighbours, ſacrilege, perjury, or other impieties to their God: and in the courts of juſtice, you will find a great part of the time employed to detect and puniſh, not only civil tranſgreſſions, as thefts, cheats, forgery, falſe-witneſs, adultery, and the like heinous crimes, perpetrated by thoſe, that before they were thoroughly ſifted, paſſed for honeſt; but you will find ſins againſt nature, ſuch as ſodomy, and other unnatural luſts, the murders of parents by their children, and innocent children by their parents, nay, ſelf-murder too; though this be a crime, which cannot be acted without a violation of what ſeems the moſt univerſal and radicated law of nature, (and is acknowledged ſo by wicked men) ſelf-preſervation. But it will not be neceſſary more ſolicitouſly to prove, that we ought, upon the teſtimony of experience, to change the opinions we thought we had rationally taken up of perſons; and therefore I ſhall now proceed to make good the propoſition in the ſenſe I chiefly intended, which is as it relates to things.

IF experience did not both inform and certify us, who would believe, that a light black powder ſhould be able, being duly managed, to throw down ſtone walls, and blow up whole caſtles and rock themſelves, and do thoſe other ſtupendous things, that we ſee actually performed by gun-powder, made uſe of in ordnance, and in mines? Who would think, that two or three grains of opium ſhould ſo ſtupify a whole body, as to force a ſleep, and oftentimes even without that ſuſpend the ſharpeſt torments in the cholick, gout, and other the moſt painful diſeaſes, and that in patients of quite different ages, ſexes, and conſtitutions, in whom alſo the diſeaſes are produced by differing, or even by contrary cauſes? Who would believe, that the poiſon, adhering to the tooth of a mad dog, though perhaps ſo little as to be ſcarce diſcernible by ſenſe, ſhould be able, after the ſlight hurt is quite healed, to continue in the warm and ſtill perſpirable body of the bitten perſon, not only for ſome days or months, but ſometimes for very many years? And after having lurked all that while, without giving any trouble to the patient, ſhould on a ſudden pervert the whole oeconomy of his body, and put him into a madneſs like that of the dog that bit him, diſcovering itſelf by that as admirable as fatal ſymptom of hydrophobia.

BUT, beſides a multitude of inſtances, that may be given of truths, that, were it not for experience, we ſhould refuſe to believe; becauſe the ſmall ſtrength of ſuch agents ſeems altogether diſproportionate to the effects aſcribed to them; many other inſtances might be alledged, wherein we aſſent to experience, even when its informations ſeem contrary to reaſon, and that, which, perhaps, we did actually and without ſcruple take to be true.

SINCE gravity is the principle, that determines falling bodies to move towards the center of the earth; it ſeems very rational to believe, with the generality of philoſophers, that therein follow *Ariſtotle*, that, in proportion as one body is more heavy than another, ſo it ſhall fall to the ground faſter than the other. Whence it has been, eſpecially by ſome of the peripatetick ſchool, inferred, that of two homogeneous bodies, whereof one does, for example, weigh ten pounds, and the other but one pound, the former being let fall from the ſame height, and at the ſame time, with the latter, will reach the ground ten times ſooner.

BUT notwithſtanding this plauſible ratiocination, experience ſhews us (and I have purpoſely tried it) that (at leaſt in moderate heights, ſuch as thoſe of our towers, and other elevated buildings) bodies of very unequal weight, let fall together, will reach the ground at the ſame time, or ſo near it, that it is not eaſy to perceive any difference in the velocity of their deſcent.

IT is generally taken for granted by naturaliſts, as well as others, that ſtrong and loud noiſes, as they are heard much farther off than fainter ſounds, ſo, if the ſonorous bodies be equally diſtant from the ear, the very ſtrong ſound will arrive much ſooner at it, than the other. And yet by the experiments of the moderns about the velocity of ſounds (in making divers of which, I have endeavoured to be accurate) it appears, that weaker ſounds are (at leaſt as to ſenſe) tranſmitted through the air as ſwiftly as ſtronger ones. And indeed, it is often obſerved, that when cannons and muſkets are diſcharged together, the noiſes of both arrive alſo together at the ear; which would not be, if the ſound of a cannon were any thing near as much ſwifter, as it is louder, than that of a muſket.

IT ſeems irrational to conceive, that a ſmaller and weaker loadſtone may draw away a piece of ſteel from a larger and ſtronger; and yet experience (which both others and I have made) evinces, that in ſome caſes this paradox is a truth.

IT has generally, by philoſophers as well as other men, been looked upon as manifeſt, and conſonant to reaſon, that cold condenſes water more or leſs, according as the degree of the cold is; and conſequently that ice is water reduced into a leſſer volume. But it is plain, by experiments carefully made (ſome of which I have elſewhere publiſhed) that by glaciation, water is rather expanded; or at leaſt, that ice takes up more room, than the water did before it was congealed. And of this ſort of inſtances, where we believe, upon the authotity of experience, things, that are contrary to what we ſhould otherwiſe judge to be a dictate or concluſion of reaſon; I could add many, if I thought it as needful in this place, as in ſome other papers, where I have given them already. An eſſay of improbable truths.

AND now it will be ſeaſonable to put you in mind, that in one part of the propoſition, hitherto diſcourſed of, it appears, that I deſigned to extend the force of the arguments, grounded upon experience, to that, which is not immediate, but vicarious; that is, not

perſonally our own, but communicated by others; provided it be competently atteſted, and duly conveyed to us.

THERE will need but a little reflection on what is judged reaſonable, and freely practiſed, by philoſophers themſelves, to juſtify this propoſition. For how many concluſions have the modern naturaliſts admitted, though not only abſtracted reaſon never led men to make them, but plauſible arguments, and the notions and axioms of the moſt generally received philoſophy were repugnant to them. Thus, that in heaven it ſelf there ſhould be generations and corruptions, was not only unobſerved before the time of *Ariſtotle* (who thence argues the incorruptibility of cœleſtial bodies) but is contradicted by his arguments; and yet both many others, and I, have ſeen great ſpots (perhaps bigger than *England*, or than *Europe* it ſelf) generated and diſſipated on or near the ſurface of the ſun; and ſeveral of the modern philoſophers and aſtronomers, having never had the good fortune to ſee any of theſe (which indeed of late years have but rarely appeared) muſt take theſe phænomena upon the credit of thoſe that have obſerved them. And much more muſt they do ſo, who, in ſpite of the vulgar philoſophy, which made all comets ſublunary, believe, there were cœleſtial, and perhaps firmamentary, comets. For, that they were above the concave of the moon's orb, we muſt believe upon the affirmation of thoſe that obſerved them, which very few have done themſelves. And the height of the famous comet, or diſappearing ſtar, in *Caſſiopæa*, in the year 1572. whereon ſo much ſtreſs is laid by our philoſophers and mathematicians, is admitted and urged, chiefly upon the belief they have, not only of *Tycho*'s veracity, but his ſkill in obſerving the motions and phænomena of that celeſtial light, and particularly its having no parallax.

IN ſhort, the great architect of experimental hiſtory, Sir *Francis Bacon*, when he divides it but into three parts, aſſigns the ſecond of them to what he calls præter-generations, ſuch as monſters, prodigies, and other things; which being (as to us) but caſualties, all thoſe that happened in other times and places than we have lived in (and thoſe will be confeſſed to be incomparably more than any of us has perſonally obſerved) we muſt take upon the credit of others. And yet theſe (vicarious experiments) by ſuggeſting new inſtances of nature's power, and uncommon ways of working; and by overthrowing, or limiting, received rules and traditions, afford us a conſiderable and inſtructive part of natural hiſtory, without which, it would not be either ſo ſound, or ſo compleat.

PROP. II. After what has been hitherto diſcourſed, it may be, I hope, both ſeaſonable and warrantable to advance to, and aſſert, our ſecond propoſition; *viz.* That "we ought "to have a great and particular regard to "thoſe things, that are recommended to our "belief, by what we have reduced to real, "though ſupernatural, experience."

FOR, 1. it is manifeſt, that the moſt rational men ſcruple not to believe, upon competent teſtimony, many things, whoſe truth did no way appear to them by the conſideration of the nature of the things themſelves; nay, though what is thus believed upon teſtimony be ſo ſtrange, and, ſetting aſide that teſtimony, would ſeem ſo irrational, that antecedently to that teſtimony, the things at laſt admitted as truths were actually rejected as errors, or judged altogether unfit to be believed. And I muſt here deſire you to conſider, that the points, wherein experience overrules that, which, before it ſupervened, was judged to be moſt agreeable to reaſon, concern things merely natural or civil, whereof human reaſon is held to be a proper judge: whereas many of the points recommended by ſupernatural experience concern things of a ſuperior order; many of which are not to be adequately eſtimated by the ſame rules with things merely corporeal or civil; and ſome of which, as the eſſence and manner of exiſtence, and ſome peculiar attributes, of the infinite God, involve or require ſuch a knowledge of what is infinite, as much paſſes the reach of our limited intellects.

BUT this is not all. For, 2. You may conſider in the next place, that, whereas it is as juſtly as generally granted, that the better qualified a witneſs is in the capacity of a witneſs, the ſtronger aſſent his teſtimony deſerves; we ought of all the things, that can be recommended to us by teſtimony, to receive thoſe with the higheſt degree of aſſent, that are taught us by God, by the intervention of thoſe perſons, that appear to have been commiſſioned by him to declare his mind to men. For the two grand requiſites of a witneſs, being the knowledge he has of the things he delivers, and his faithfulneſs in truly delivering what he knows; all human teſtimony muſt on theſe accounts be inferior to divine teſtimony: ſince this (latter) is warranted both by the veracity of God (which is generally acknowledged by thoſe that believe his exiſtence) and by his boundleſs knowledge; which makes it as impoſſible he ſhould be deceived himſelf, as the other does, that he ſhould deceive us. And, becauſe that, for the delivery of the divine teſtimony we are ſpeaking of, it has oftentimes pleaſed God, who is a moſt free, as well as a moſt wiſe agent, to make uſe of unpromiſing perſons as his inſtruments; I ſhall not on this occaſion altogether overlook this circumſtance, that an experimental philoſopher ſo often encreaſes his knowledge of natural things, by what he learns from the obſervations and practices, even of mean, and perhaps of illiterate, perſons (ſuch as ſhepherds, plowmen, ſmiths, fowlers, *&c.*) becauſe they are converſant with the works of nature; that he is not only willing to admit, but often curious to ſeek for informations from them; and therefore is not like to find much repugnancy in receiving the doctrines of revealed religion, ſuch as Chriſtianity, if the teachers of it were honeſt men, and had opportunity to know the truth of the things they deliver, though they

they were fiſhermen, tentmakers, or ſome other mean profeſſion.

AND indeed (to enlarge a little upon a ſubject, that, I fear, has ſcarce been conſidered) ſuch a perſon as our virtuoſo will, with both great willingneſs and no leſs advantage, exerciſe himſelf in peruſing, with great attention and much regard, the writings of the apoſtles, evangeliſts, and ancient prophets; notwithſtanding any meanneſs of their firſt condition, or of their ſecular employments. And in theſe ſacred writings, he will not only readily ſuffer himſelf to be inſtructed in theſe grand and catholick articles of religion, which, becauſe of their neceſſity or very great uſefulneſs, are to be met with in many places, and in variety of expreſſions, by honeſt and duly diſpoſed readers; but he will, inſtead of diſdaining ſuch tutors, both expect, and carefully ſtrive, to improve his knowledge of divine things in general, even by thoſe hints and incidental paſſages, that a careleſs or ordinary reader would overlook, or not expect any thing from. For, as the fecundity of the ſcriptures is not wont to be enough diſcerned, when the ſacred writers tranſiently touch upon, or glance at, a great many ſubjects, that they do not expreſly handle, and that therefore are not vulgarly taken notice of; ſo the docility we have aſcribed to our virtuoſo will make him repoſe a great deal of truſt in the teſtimony of inſpired perſons, ſuch as Chriſt and his apoſtles, about things of all ſorts, either uſually taken notice of or not, that relate to objects of a ſupernatural order; eſpecially if among theſe God himſelf, and his purpoſes, be compriſed, ſince divers of thoſe things are not knowable without revelation, and others are beſt known by it. And to be allowed to ground a belief about ſuch things on the relations and other teſtimonies of thoſe that were, in the ſcripture-phraſe, "eye witneſſes and miniſters" of the things they ſpeak of, will by our virtuoſo be juſtly reputed ſuch an advantage, in order to the knowledge of things divine, as the conſulting with navigators and travellers to *America* is to him, that is curious to learn the ſtate of that new world. For an ordinary ſeaman or traveller, that had the opportunity with *Columbus* to ſail along the ſeveral coaſts of it, and paſs up and down through the country, was able at his return to inform men of an hundred things, that they ſhould never have learned by *Ariſtotle*'s philoſophy, or *Ptolomy*'s geography; and might not only acquaint them with divers particulars, conſonant to the opinions, which their formerly received phyſicks and coſmography did ſuggeſt, but alſo rectify divers erroneous preſumptions and miſtakes, which till then they thought very agreeable to the dictates of thoſe ſciences, and ſo to reaſon. And as one, that had a candid and knowing friend intimate with *Columbus*, might better rely on his informations about many particulars of the natural hiſtory of thoſe parts, than on thoſe of an hundred ſchool-philoſophers, that knew but what they learned from *Ariſtotle*, *Pliny*, *Ælian*, and the like ancient naturaliſts; ſo, and much more, may we rely on the accounts given us of theological things, by the apoſtles, and conſtant attendants of him that lay in the "boſom of God his Father," and commiſſioned them to declare to the world "the whole "counſel of God," as far as it was neceſſary for man to know. Luke i. 2. John i. 18. Act. xx. 27.

WE know, that fuller trials are allowed among ingenious men, to rectify the informations of the more imperfect ones; and therefore I ſhall add, that though the innate notions and ſentiments, that nature gives us of the attributes and mind of God, be highly to be prized; yet the informations, that theological experience affords of thoſe abſtruſe things, is far more excellent and compleat. For methinks, thoſe great "depths of God" may be compared to the depths of the ocean. And we know, that in the ſea there are ſome abyſſes ſo deep, that the ſeaman's ſounding-lines have never been able to reach to the bottom of them; and where they are not unfathomable, all we are wont to do by our ſoundings, is, to fetch from the bottom ſome little gravel, or mud, or ſhells, or ſome ſuch thing, that ſticks to the tallowed end of the plummet, and gives us but a very imperfect account of the bottom, even of the ſhallower parts of the ſea: but if a ſkilful diver be employed, he will not only tell us, whether the bottom be muddy, gravelly, or ſandy, but will be able to give us a kind of topography of that ſubmarine land, and acquaint us with many ſurpriſing particulars, that we ſhould never otherwiſe have diſcovered, or perchance ſo much as dreamed of. And peradventure it may be no hyperbole to ſay, that the informations of a plummet, which reaches not to ſome depths, and brings but a very ſlender account of ſoils that lie in any, are not more ſhort of thoſe of a diver, than the informations philoſophy gives us of ſome divine things are of thoſe compleater ones, that may be had from the holy Scriptures. And when I remember, how many opinions about the ſubmarine parts, that I, among many other men, thought probable, I found cauſe to change, upon the converſation I had with a famous diver, that ſometimes, by the help of an engine, ſtayed ſeveral hours at the bottom of the ſea; I find the leſs reluctancy to ſuffer opinions about divine matters, that before ſeemed probable to me, to be rectified by the fuller diſcoveries made of thoſe things by the preachers of the goſpel. 1 Cor. ii. 10.

YOU may find ſome things appliable to the confirmation of what has been newly delivered in an eſſay, (which you may ſee when you pleaſe) that conſiders the bounds and uſe of experience in natural philoſophy. Wherefore remembring, that before this late excurſion I was ſpeaking of miracles, I ſhall now reſume the ſubject, and proceed to tell you, that I have the more inſiſted upon the miracles, that may be pleaded to recommend the Chriſtian religion, becauſe I thought, that an argument grounded on them is little leſs than abſolutely neceſſary, to evince, that any

religion, that men believe to be ſupernaturally revealed, and conſequently that the Chriſtian does really proceed from God.

FOR, though the excellency of the Chriſtian doctrine, and other concurrent motives, may juſtly perſuade me, that it is worthy and likely to be given by God; yet that *de facto* this doctrine comes from him by way of ſupernatural revelation, I can ſcarce be ſufficiently aſcertained, but by the miracles wrought by Chriſt and his diſciples, to evince, that the doctrine they preached, as commiſſioned by God to do ſo, was indeed his, being as ſuch owned by him. But theſe miracles having been wrought (when it was moſt fit and needful they ſhould be wrought) in the firſt ages of the church, we, that live at ſo great a diſtance from them, can have no knowledge of them by our own ſenſes, or immediate obſervation; but muſt believe them upon the account of the formerly mentioned hiſtorical or vicarious experience, which is afforded us by the duly tranſmitted teſtimony of thoſe, that were themſelves (to ſpeak once more in an evangeliſt's phraſe) "eye-witneſſes and miniſters" of the things they relate. And ſince we ſcruple not to believe ſuch ſtrange prodigies, as celeſtial comets, vaniſhing and reappearing ſtars, iſlands founded by ſubterraneal fires in the ſea, darkenings of the ſun for many months together, earthquakes reaching above a thouſand miles in length, and the like amazing anomalies of nature, upon the credit of human hiſtories; I ſee not, why that vicarious experience ſhould not more be truſted, which has divers peculiar and concurrent circumſtances to confirm it, and particularly the death, that moſt of the firſt promulgators chearfully ſuffered to atteſt the truth of it, and the ſucceſs and ſpreading of the doctrine authoriſed by thoſe miracles, and received chiefly upon their account. To which things ſome perhaps would add, that it is leſs credible, that the author of nature ſhould, for moſt weighty purpoſes, make ſtupendous alterations of the courſe of nature, than that nature herſelf, for no ſuch end, ſhould by ſuch prodigies, as are newly mentioned, as it were, throw herſelf out of her own courſe.

Luke i. 2.

MIRACLES being ſo neceſſary to the eſtabliſhment of revealed religion in general, it may be looked upon as a farther diſpoſition in our virtuoſo, to receive the Chriſtian religion, that the philoſophy, he cultivates, does much conduce to enable him to judge aright of thoſe ſtrange things, that are by many propoſed as miracles, and believed to be ſo.

FOR firſt, the knowledge he has of the various, and ſometimes very wonderful operations of ſome natural things, eſpecially when they are ſkilfully improved, and dexterouſly applied by art, particularly mathematicks, mechanicks, and chemiſtry, will qualify him to diſtinguiſh between things, that are only ſtrange and ſurpriſing, and thoſe that are only miraculous; ſo that he will not miſtake the effects of natural magick, for thoſe of a divine power. And by this well-inſtructed warineſs, he will be able to diſcover the ſubtil cheats and colluſions of impoſtors; by which, not only multitudes of all religions, eſpecially heathen, but even learned men of moſt religions, for want of an inſight into real philoſophy, have formerly been, or are at this day deluded, and drawn into idolatrous, ſuperſtitious, or otherwiſe erroneous tenents or practices.

AND on the other ſide, the knowledge our virtuoſo may have of what cannot be juſtly expected or pretended from the mechanical powers of matter, will enable him to diſcern, that divers things are not produceable by them, without the intervention of an intelligent ſuperior power; on which ſcore he will frankly acknowledge, and heartily believe, divers effects to be truly miraculous, that may be plauſibly enough aſcribed to other cauſes in the vulgar philoſophy; where men are taught and wont to attribute ſtupendous unaccountable effects to ſympathy, antipathy, *fuga vacui*, ſubſtantial forms, and eſpecially to a certain being, preſumed to be almoſt infinitely potent and wiſe, which they call nature: for this is repreſented as a kind of goddeſs, whoſe power may be little leſs than boundleſs; as I remember *Galen* himſelf compares it to that of God, and ſaith, that he could not do ſuch a thing, becauſe nature cannot; and cenſures *Moſes* for ſpeaking as if he were of another mind. The whole paſſage is ſo weighty, that I thought fit to direct you to it in the margin; though, to comply with my haſte, I forbear to tranſcribe and deſcant upon ſo prolix a one, and add to it divers other paſſages, that I have met with in famous authors; who, for want of knowing the true extent of the powers of matter and motion, left to themſelves in the ordinary courſe of things, aſcribe to natural cauſes, as they call them, ſuch effects as are beyond their reach, unleſs they be elevated by agents of a ſuperior order,

Gal. de Uſu part. Lib. 11. *Cap.* 14.

I know it may be objected, that the hitherto-mentioned diſpoſitions, that experimental knowledge may give a man to admit the hiſtories of the miracles recorded in the goſpel; and likewiſe to expect, that God will be able to perform the promiſes and menaces that are in his name delivered there, may be countervailed by this, that thoſe, who are ſo much acquainted with the myſteries of nature, and her various and ſtrange ways of working, as a virtuoſo may well be, may by that knowledge be ſtrongly tempted to think, that thoſe ſurpriſing things, that other men call miracles, are but effects of her power; the extent of which is not eaſily diſcerned by ordinary men, nor ſafely defined by philoſophers themſelves. But this objection being plauſible enough, to make me think it deſerved to be ſeriouſly conſidered, I took an occaſion, that was once offered me, to examine the validity of it in a paper by itſelf; and this being at your command, I ſhall refer you to it. And I hope, that in the mean time it may ſuffice to ſay, that to make it reaſonable to judge this or that particular performance a ſupernatural one, it is not at all neceſſary, that it ſurpaſs the whole power of nature,

that is, of phyſical agents, provided it ſurpaſs the power of that cauſe, or that complex of cauſes, from which the effect muſt in reaſon, if it be purely natural or phyſical, be ſuppoſed to have proceeded. As for inſtance, that a fiſherman or two ſhould ſpeak other languages than their own, does not at all exceed the power of nature, if they employed a competent time in learning them. But that a great number of fiſhermen, and other illiterate perſons, ſhould all on a ſudden become linguiſts, and in an hour's time be able to ſpeak intelligibly to a great number and variety of nations in their reſpective languages, as the new teſtament relates, that the apoſtles and their companions did on the day of pentecoſt: that gift of tongues, I ſay, was an ability, which in thoſe circumſtances of place, time, and perſons, wherein it was exerciſed, may juſtly be concluded to have been ſupernatural or miraculous.

See Acts ii.

I FEAR you will think I have dwelt too long upon the argument for Chriſtianity, drawn from that ſort of matter of fact we call miracles; though the uncommon way, that my deſign led me to repreſent them in, would not permit me to make it out in fewer words. Wherefore I ſhall now paſs on to another argument, in favour of the ſame religion, that is afforded by experience, being drawn from the ſtrangely ſucceſsful propagation, and the happy effects of Chriſtianity in the world. But having formerly had occaſion to diſplay this argument in a ſeparate paper, which you may command a ſight of, if I ſhall not have time to annex a tranſcript of it to the latter ſheets of this firſt part of the preſent eſſay, I will refer you for more ample proof to that writing, and content myſelf in this place briefly to touch ſome of the heads, and ſubjoin a reflection or two, that you will not meet with in that paper.

IT is a notorious matter of fact, that in leſs than half an age, the Chriſtian religion was ſpread over a great part of the then known world; inſomuch, that in a few years after it began to be preached, the apoſtle of the Gentiles could tell the Romans with joy, that their faith (*i. e.* profeſſion of the goſpel) "was ſpoken of throughout the whole world." And in the ſecond century, *Tertullian*, and other famous writers, ſhew, that the goſpel had already numerous proſelytes in a great number of different kingdoms and provinces. But I forbear to mention what he and others have magnificently ſaid of the ſucceſs of the goſpel, becauſe I had rather refer you to the plain narratives made of it by *Euſebius*, *Socrates Scholaſticus*, and other grave authors; being of opinion, that mere hiſtorians may give, to a philoſophical reader, a more advantageous idea of the efficacy of that excellent doctrine, than eloquent orators, as ſuch, can do. This wonderful quick progreſs of this religion being aſcertained to our virtuoſo, by a thing he is ſo much ſwayed by as experience; it does not a little diſpoſe him to believe the truth of ſo prevalent a religion: For if he conſiders the perſons, that firſt promulgated it, they were but half a ſcore of illiterate fiſhermen, and a few tent-makers and other tradeſmen. If he conſiders the means, that were employed to propagate this doctrine, he finds, that they had neither arms, nor external power, to compel men to receive it; nor riches, honours, or preferments, to bribe or allure them to it; nor were they men of philoſophical ſubtilty, to intrap or entangle the minds of their auditors. Nor did they make uſe of the pompous ornaments of rhetorick, and fetches of oratory, to inveigle or entice men; but treated of the moſt ſublime and abſtruſe matters, in a moſt plain and unaffected ſtile, as became lovers and teachers of truth. If he conſiders the nature of the doctrine, that in little time obtained ſo many proſelytes, he will find, that inſtead of being ſuited to the natural apprehenſions, or the received opinions of men; and inſtead of gratifying their corrupt affections, or complying with ſo much as their innoceneſt intereſts; it preſcribed ſuch mortifications, and ſuch great ſtrictneſs of life, and high degrees of virtue, as no legiſlator had ever dared to impoſe upon his ſubjects, nay, nor any philoſopher on his diſciples. And this doctrine was propoſed in ſuch a way, and was accompanied with predictions of ſuch hardſhips and perſecutions, that ſhould in thoſe times be the portion of its ſincere profeſſors, as if the law-giver had deſigned rather to fright men from his doctrine, than allure them to it; ſince they could not believe what he ſaid, and foretold, to be true, without believing, that they ſhould be made great ſufferers by that belief. If our virtuoſo conſiders the oppoſition made to the progreſs of the goſpel, he will find cauſe to wonder, that it could ever be ſurmounted. For the heathens, which made by far the greateſt part of the world, were deeply engaged in polytheiſm, idolatry, magical rites and ſuperſtitions, and almoſt all kind of crimes, and ſome of theſe were ſhameleſs debaucheries, which oftentimes made a part of their worſhip. And the Jews were by the corrupt leaven of the Phariſees, and the impious errors of the Sadducees, and the general miſtakes of the nation about the perſon, office, and kingdom of the *Meſſias*; and by their dotage upon their vain traditions, and numerous ſuperſtitions grounded upon them: the Gentiles, I ſay, and the Jews, who were thoſe, that were to be converted, were, on theſe and other accounts, highly indiſpoſed to be made proſelytes. Eſpecially when they could not own themſelves to be ſuch, without expoſing their perſons to be hated and deſpiſed, their poſſeſſions to be confiſcated, their bodies to be impriſoned and tormented, and oftentimes their lives to be in as ignominious as cruel ways deſtroyed. And whilſt the ſecular magiſtrates made them ſuffer all theſe miſchiefs, the venerated prieſts, the ſubtil philoſophers, and the eloquent orators, perſuaded the world, that they deſerved yet more than they endured, and employed all their learning and wit to make the religion odious and ridiculous, as well as the embracers of it miſerable;

Rom. i. 8.

miſerable; accuſing the martyrs, and other Chriſtians, of no leſs than atheiſm, inceſt, and the inhuman ſhedding and drinking the innocent blood of infants. Theſe and the like matters of fact when our virtuoſo reflects on, and conſiders by what unpromiſing means, (as far as they were but ſecular) ſuch ſeemingly inſurmountable difficulties were conquered; he cannot but by this hiſtorical experience be inclined to think, that effects, ſo diſproportionate to the viſible means, could not be brought to paſs without the peculiar aſſiſtance and extraordinary bleſſing of God: by whom thoſe ſucceſsful preachers averred themſelves to be commiſſionated. For, that the ſupernatural help the Chriſtian doctrine appears to have had, was divine, not diabolical, will ſeem evident to our virtuoſo, from the nature, tendency, and effects of the doctrine itſelf, which expreſsly teacheth, that there is but one God; that he alone is to be worſhipped, and not idols, nor any of the heathen dæmons or deities; that the devils are wicked, apoſtate, malicious, and miſerable creatures, that are hated of God, and do extremely hate mankind; and that thoſe vices, as well as rites of worſhip, that they have eſtabliſhed in the world, were abominable to God, and would be by degrees deſtroyed by him: as in effect they ſoon began to be in many places of the world, where the worſhippers of Chriſt caſt the devil out of his temples, out of men's veneration, and oftentimes out of their bodies too.

ONE circumſtance there is of the propagation of the goſpel, which, though it may ſeem more extrinſical than thoſe hitherto mentioned, is yet too conſiderable to be here pretermitted; ſince it is this, that the quick ſpreading and ſucceſs of the Chriſtian doctrine in the world was foretold both by the prophets of the old teſtament, and the author and promulgators of the new. For it being notorious, that there have been divers errors and ſuperſtitions, that have with too much celerity been ſpread far and wide in the world, either by mere accidents, (as they were reputed) that were very friendly to them, or by the induſtry and artifices of men: this, I ſay, being ſo, it ought to be no ſmall ſatisfaction to equitable judges, that the quick progreſs, and notable effects of the Chriſtian religion, were foretold, partly by the ancient prophets, and partly by the Meſſias and his apoſtles. For by theſe accompliſhed predictions it may appear, that the wonderful ſucceſs of the goſpel was not an effect of chance, but was long before determined by divine providence, as a work fit to be dear to God, and to be accompliſhed in a wonderful way by his peculiar aſſiſtance, (as will by and by be ſomewhat more fully declared.) That the triumphs of the goſpel were foretold by ſeveral of the old prophets, may appear by their yet extant writings; ſome of which are alledged to that purpoſe by thoſe writers of the new teſtament, that were endowed with the ſame prophetick ſpirit. And if you pleaſe to conſider the paſſages cited in the margin, you will eaſily grant, that thoſe ancient inſpired writers foreſaw, that in the days of the Meſſias, there ſhould be a great and notable converſion of the Gentiles of ſeveral nations, to the worſhip of the only true God of Iſrael: and though God did not think fit, that thoſe predictions extant in the goſpel ſhould be ſo conſpicuous and pompouſly ſet forth, that ſpeak of the converſion, that ſhould be made, not only of the heathen world, but (of a more refractory portion of mankind) a great part of the Jewiſh nation, to the Chriſtian doctrine; yet there are divers paſſages in the new teſtament, that are real, though ſome of them unheeded prophecies of the wonderful progreſs of the goſpel, and the large extent of the kingdom of the Meſſias. Thus Chriſt foretold, that his twelve apoſtles ſhould be his witneſſes, not only in *Judea* and *Samaria*, but to the uttermoſt parts of the earth. And according to the moſt probable explication of that text, in the xxivth of St. *Matthew*'s goſpel, which is uſually referred to the end of the world, but ſeems rather to reſpect the deſtruction of *Jeruſalem*; there is a prediction, that before "the end (of Mat. xxiv. "the Jewiſh polity, as well as the Moſaical 14. "oeconomy) the goſpel of the kingdom (of "the Meſſias) ſhould be preached or pro- Παρὰ τῶν "claimed in the whole world," (in that ſenſe ὅλην. Luke ii. 1. of the term world, that was then much in uſe, and was employed by the evangeliſt *Luke* to ſignify the Roman world or empire.) To which may be added, that ten or twelve fiſhermen (called the apoſtles) were ſent to convert all nations to the worſhip of a crucified perſon; which would have been a ſtrange commiſſion to be given ſuch men at that time, if their maſter, who ſent them, had not foreſeen the ſucceſs, as well as known the truth of the doctrine he ſent them to preach. The quick diffuſion of the Chriſtian faith, and the ſwift growth of the Chriſtian church from deſpicable beginnings to a greatneſs very diſproportionate to them, are more than intimated by what Chriſt ſays of the leaven hid in a great quantity of meal; and of the muſtard-ſeed, that quickly grows (in the hot and fertile country of *Judea*) to a wonderful bigneſs and height; ſince theſe paſſages, that perfunctory readers look on but as mere parables, were really prophecies, that quickly began to be manifeſtly fulfilled. And it may bring no ſmall authority to the predictions of the new teſtament, that when divers of them were made, there appeared no likelihood, that they ſhould ever be made good. When a poor virgin, that was betrothed to a carpenter, confidently pronounces, that *all ages ſhould call her bleſſed*; what probability was there, that what ſhe ſaid, ſhould come to paſs? And when another private woman, then living in a village, had it foretold her, that a cenſured action of hers Mat. xxvi. ſhould be reported through the whole world, 13. to her great praiſe; what ſober man, that were not a prophet, would venture to loſe his credit, by making ſuch a promiſe? And therefore, ſince we ſee ſuch unlikely predictions actually accompliſhed,

Gen. xlix. 11. Iſa. ii. 2. Pſal. ii. 8 Mal. i. 11

accompliſhed, it may well convince an unbiaſſed man, that the authors of them, as well as the ancient ſeers, were really endowed with a truly prophetick ſpirit; and that the events, by that foretold, were not effects of chance or policy, but of divine providence.

I THOUGHT it not improper to make the mention of theſe predictions follow ſo cloſe the diſcourſe of the miracles, becauſe true prophecies of unlikely events, fulfilled by unlikely means, are ſupernatural things; and as ſuch, (eſpecially their author and deſign conſidered) may properly enough be reckoned among miracles. And I may add, that theſe have a peculiar advantage above moſt other miracles, on the ſcore of their duration: ſince the manifeſt proofs of the prediction continue ſtill, and are as viſible as the extent of the Chriſtian religion; and ſome of them are ſtill more and more accompliſhed by the converſions made of multitudes of infidels, in ſeveral vaſt regions of *America*, (to name no other countries.) So that if we may call ſome miracles tranſient ones, ſuch as the turning water into wine at a wedding-feaſt in *Galilee*; and the darkening of the ſun, when the moon was full, at the crucifixion of Chriſt: accompliſhed predictions may be ſtiled permanent ones; and their difference may be ſet forth by the differing ſtates of the Moſaick Manna: for, though both that, which fell daily (except on the ſabbath) in the wilderneſs, and that which was laid up in a pot before the teſtimony, were ſupernatural productions; yet whereas a portion of the former outlaſted not two or three days, that kept in the pot was preſerved many ages, and continued to be (as it was foretold it ſhould) a viſible miracle.

Exod. xvi. 14, 21, 20, 33.

THERE is another reaſon, why the wonderful propagation of the goſpel ſhould be annexed to the argument drawn from miracles in favour of the Chriſtian religion. For the preachers of it both pretended and appealed to miracles, as proofs of the truth of their doctrine: and if we conſider the great diſadvantages they lay under, and the powerful oppoſition of all ſorts, that they met with and ſurmounted; it cannot reaſonably be thought, that ſuch unlikely men ſhould ſo ſucceſsfully preach ſo uninviting a doctrine, unleſs it were confirmed by conſpicuous miracles: or at leaſt, if ſo uneaſy and perſecuted a religion was propagated without miracles, that propagation itſelf (as one of the fathers well obſerves) may juſtly paſs for a miracle; and be no leſs fit than another, to confirm the religion ſo admirably propagated.

THE paſt diſcourſe has, I hope, manifeſted, that a virtuoſo has ſome helps, that other men generally ſpeaking have not, to make him judiciouſly approve the arguments for the truth of the Chriſtian religion, that are grounded on the miracles wrought in its favour, and the wonderful ſucceſs of it in the world. But becauſe a revealed religion, how true ſoever it be, can ſcarce be proved but by moral demonſtrations; and becauſe for this reaſon, it is not always ſufficient, that the arguments be good in their kind, but there are ſome qualifications required in the minds of them that are to be convinced by him; I ſhall now add, that experimental philoſophy does alſo diſpoſe the minds of its cultivators to receive due impreſſions from ſuch proofs, as miracles do, as well as other topicks, afford the Chriſtian religion.

ANOTHER thing then, that qualifies an experimentarian for the reception of a revealed religion, and ſo of Chriſtianity, is, that an accuſtomance of endeavouring to give clear explications of the phænomena of nature, and diſcover the weakneſs of thoſe ſolutions, that ſuperficial wits are wont to make and acquieſce in, does inſenſibly work in him a great and ingenuous modeſty of mind. And on the ſcore of this intellectual, as well as moral virture, not only he will be very inclinable, both to deſire and admit further information, about things which he perceives to be dark or abſtruſe; but he will be very unapt to take, for the adequate ſtandard of truth, a thing ſo imperfectly informed, and narrowly limited, as his mere or abſtracted reaſon, (as I think I have elſewhere intimated, that one may call that, which is furniſhed only with its own, either congenite, or very eaſily and very early acquired notions and ideas, and with popular notices.) And though a vulgar philoſopher, that allows himſelf to refer the obſcureſt things in nature to ſubſtantial forms, real qualities, ſympathy, antipathy, and ſome few other terms, which, to be employed by him, need not, and perhaps for their darkneſs cannot be clearly underſtood; and by which he pretends to explain all things in nature, and may indeed explicate one thing as well as another; though (I ſay) ſuch a titular philoſopher may preſume, that he underſtands every thing, and may be eaſily tempted to think, that he muſt not hope, nor deſire to learn from leſs able men than his firſt teachers; and that, that cannot be true, or be done, which agrees not with his philoſophy; yet a ſober and experienced naturaliſt, that knows what difficulties remain yet unſurmounted in the preſumedly clear conception and explications even of things corporeal, will not, by a lazy or arrogant preſumption, that his knowledge about things ſupernatural is already ſufficient, be induced to reject, or to neglect any information, that may encreaſe it.

AND this frame of mind is a very happy one for a ſtudent in revealed theology, where cautiouſneſs is not more neceſſary for the avoiding of errors, than docility is advantageous for the learning of truth: ſince the knowledge and goodneſs of the divine teacher is ſuch, that a ſcholar, to improve his intellect, needs but bring a mind fitted to receive the genuine informations, that are moſt liberally offered (in the Scripture) and will never deceive him; then employs, together with fervent prayers, a due carenot to miſtake the meaning of them.

AN aſſiduous converſation with the exquiſitely framed, and admirably managed works of God, brings a ſkilful conſiderer of them to diſcover

diſcover from time to time, ſo many things to be feaſible, or to be true, which, whilſt he argued but upon grounds of incompetently informed reaſon, he judged falſe or unpracticable; that little by little he acquires a habit of receiving ſome ſorts of opinions, and eſpecially thoſe that ſeem unfriendly to religion, but as probationers, with a diſpoſition to reform or diſcard them upon further information. And this as he is reſolved to ſubmit to, in caſe he meets with it, ſo he is diſpoſed to receive, if not to expect it, by having often found himſelf obliged, upon ſubſequent information, to mend or lay aſide his former opinions, though very agreeable to the beſt light he had to judge by, when he entertained them. As though it ſeems a viſible truth, that the diſcus of *Venus* is, in all reſpects to the ſun, totally luminous; yet when the teleſcope diſcovers her to have her full and her wane, like the moon, he will believe this further obſervation againſt the firſt made with his naked eyes.

AND indeed, I have ſometimes doubted, whether to be verſed in mathematicks, and other demonſtrative parts of philoſophy, bring a greater advantage to the mind, by accuſtoming and aſſiſting it to examine ſtrictly things propoſed for truths, and to evince ſtrongly the truths a man knows to others, than by fitting him to diſcern the force of a good argument, and ſubmit willingly to truths clearly evinced, how little ſoever he may have expected to find ſuch concluſions true. It will not be difficult to apply theſe reflections to our preſent purpoſe, ſince there are ſeveral paſſages in the Scripture, that ſufficiently declare, both that multitudes perſiſt in a criminal infidelity, out of an overweaning conceit of their own knowledge, and a readineſs to be ſwayed rather by ſtrong prejudices, than by the ſtrongeſt arguments that would remove them; and that docility is a very happy diſpoſition to the entertainment of revealed religion: in reference to which, this qualification will be the more eaſily found in our virtuoſo; becauſe, whereas the things, about which he has been accuſtomed to be ſenſible of his ignorance, or deſire further inſtruction, are within the ſphere of nature, and the juriſdiction of philoſophy; many of the things that revealed religion declares, (ſuch as are the decrees, the purpoſes, the promiſes, *&c.* of God, and his moſt peculiar manner of exiſting and operating) are things ſo ſublime and abſtruſe, that they may well be looked upon as of an higher order than merely phyſical ones, and cannot be ſatisfactorily reached by the mere light of nature. It is true, that our philoſopher, becauſe he is ſo, will examine more ſtrictly, than ordinary men are wont or able to do, the proofs brought for this or that propoſed revelation. But that is no diſadvantage to a ſupernatural religion, ſuch as the Chriſtian, if it be, as we now ſuppoſe it to be, true; and the real truth about religion itſelf does not require credulity, but only docility. And perhaps this matter may be illuſtrated, by comparing what happens to a philoſopher in the examen of opinions, and to a chemiſt in that of metals. For if a piece of coin, that men would have paſs for true gold, be offered to an ordinary man, and to a ſkilful refiner; though the latter will examine it more ſtrictly, and not acquieſce in the ſtamp, the colour, the ſound, and other obvious marks, that may ſatisfy a ſhop-keeper, or a merchant; yet when he has tried it by the ſeverer ways of examining, ſuch as the touchſtone, the cupel, aqua fortis, *&c.* and finds it to hold good in thoſe proofs, he will readily and frankly acknowledge, that it is true gold, and will be more thoroughly convinced of it, than the other perſon, whoſe want of ſkill will make him ſtill apt to retain a diſtruſt, and render him indeed more eaſy to be perſuaded, but more difficult to be fully ſatisfied. On the like account, though our virtuoſo will examine with more ſtrictneſs and ſkill, than ordinary men are able, miracles, prophecies, or other proofs, ſaid to be ſupernatural, that are alledged to evince a revealed religion; yet if the certain and genuine characters of truth appear in it, he will be more thoroughly convinced of it than a leſs ſkilful man, whoſe want of good criteria (or touchſtones) and ſound judgment will encline him to be diffident, and to be ſtill afraid of having been impoſed on.

I EXPECT in the mean time, that you ſhould here object againſt what has been ſaid in the later leaves of the paſt diſcourſe, that it hath degraded the human intellect, by aſcribing ſo much to experience, natural or ſupernatural, that it has left nothing for reaſon to do, unleſs ſervilely to obey.

BUT though this objection be plauſible, yet the anſwer to it will not be very difficult, if the matter itſelf be duly conſidered, and reaſon be brought to act, even on this occaſion, not as an intereſſed party, but an unbiaſſed judge.

FOR we have already ſhewn, that rational philoſophers ſcruple not to alter or renounce the opinions, that ſpecious reaſons had ſuggeſted to them, when once they either find thoſe opinions contradicted by experience, or meet with other opinions more conformable to experience. And *Ariſtotle* himſelf, though he be accuſed to have, perhaps the firſt of all the ancient naturaliſts, perverted phyſicks, by wreſting them to a compliance with logical and metaphyſical fancies; yet even he confeſſes, not only that in the ſcience of nature reaſon ought to comport with the phænomena, and the phænomena with reaſon; but that to adhere to plauſible ratiocinations, with the neglect of ſenſible obſervations, is a weakneſs, or diſeaſe (ἀῤῥωστία) of mind. I will not here mention what I ſay in another paper, by way of attempt to ſettle the bounds of reaſon and experience, in reference to natural philoſophy; but it may concern our preſent argument, to employ a few lines in this place, towards the further clearing the lately propoſed objection. We may obſerve then, that, whether or no it be true, which is taught by *Ariſtotle*, and commonly received

in the ſchools, that the underſtanding is like blank paper; and that it receives no knowledge, but what has been conveyed to it through the ſenſes: whether, I ſay, this be or be not admitted, it is plain, that the notions, which are either congenite with the underſtanding, or ſo eaſily and early acquired by it, that divers philoſophers think them innate, are but very few in compariſon of thoſe, that are requiſite to judge aright about any one of a multitude of things, that occur either in natural philoſophy, or theology. For in the divine nature, power, wiſdom, and other attributes, there is a fecundity, that has produced a world of contrivances, laws, and other things, that exceedingly ſurpaſs both the number and variety, that the dim and limited intellect of man could reach to, by framing and compounding ideas, without the aſſiſtance of the patterns, afforded by the works and declarations of God.

ON the account of the ſame prerogative of the divine knowledge, it muſt frequently happen, that the notions and opinions men take up of the works and mind of God, upon the mere ſuggeſtions of the abſtracted reaſon, (if I may ſo call it) newly ſpoken of, muſt not only be almoſt always very deficient, but will be oftentimes very erroneous. Of which we ſee evident proofs in many of the opinions of the old philoſophers, who, though men of ſtrong natural parts, were miſled by what they miſtook for reaſon, to maintain ſuch things about the works and the author of nature, as we, who, by the favour of experience and revelation, ſtand in a much clearer light, know to be falſe, and often juſtly think utterly extravagant.

THE importance of the ſubject lately ſpoken of, and its being too little conſidered, may make it deſerved to be inculcated; and therefore I ſhall ſubjoin on this occaſion, that that, which I have lately called abſtracted reaſon, is but a narrow thing, and reaches but to a very ſmall ſhare of the multitude of things knowable, whether human or divine, that may be obtained by the help of further experience, and ſupernatural revelation. This reaſon, furniſhed with no other notices than it can ſupply itſelf with, is ſo narrow and deceitful a thing, that he, that ſeeks for knowledge only within himſelf, ſhall be ſure to be quite ignorant of far the greateſt part of things, and will ſcarce eſcape being miſtaken about a good part of thoſe he thinks he knows.

BUT notwithſtanding what has been hitherto ſaid, I am far from intending to deny reaſon any of its juſt prerogatives. For I ſhew in another paper, that experience is but an aſſiſtant to reaſon, ſince it doth indeed ſupply informations to the underſtanding; but the underſtanding remains ſtill the judge, and has the power or right to examine and make uſe of the teſtimonies, that are preſented to it. The outward ſenſes are but the inſtruments of the ſoul, which hears by the intervention of the ear, and in reſpect of which the eye itſelf is but a more immediate optical tube; and the ſenſe does but perceive objects, not judge of them. Nor do the more wary among the philoſophers, truſt their eye to teach them the nature of the viſible object; but only to employ it to perceive the phænomena it exhibits, and the changes that happen to itſelf by the action of it. And whereas it is confeſſed, that the ſenſories may deceive us, if the requiſites of ſenſation be wanting, as when a ſquare tower appears round at a great diſtance, and a ſtrait ſtick half in the water appears crooked, becauſe of the doubled medium; it is the part of reaſon, not ſenſe, to judge, whether none of the requiſites of ſenſation be wanting; which (give me leave to add) oftentimes requires, not only reaſon, but philoſophy; and then alſo it is the part of reaſon to judge, what concluſions may, and what cannot be ſafely grounded on the informations of the ſenſes, and the teſtimony of experience. So that when it is ſaid, that experience corrects reaſon, it is ſomewhat an improper way of ſpeaking; ſince it is reaſon itſelf, that upon the information of experience, corrects the judgments ſhe had made before.

AND this (borrowed from the forementioned paper, becauſe it was never publiſhed) prompts me to illuſtrate the uſe of reaſon, by comparing her to an able judge, who comes to hear and decide cauſes in a ſtrange country. For the general notions he brings with him, and the dictates of juſtice and equity can give him but a very ſhort and imperfect knowledge of many things, that are requiſite to frame a right judgment about the caſes, that are firſt brought before him; and before he has heard the witneſſes, he may be very apt to fall into prejudicate opinions of things, (whether perſons or cauſes.) But when an authentick and ſufficient teſtimony has cleared things to him, he then pronounces, according to the light of reaſon, he is maſter of; to which the witneſſes did but give information, though that ſubſequent information may have obliged him to lay aſide ſome prejudicate opinions he had entertained before he received it. And what is ſaid of natural experience, in reference to the underſtanding, may, with due alteration, be applied to ſupernatural revelation: for here alſo the underſtanding is to examine, whether the teſtimony be indeed divine; and whether a divine teſtimony ought to be (as it will eaſily perceive it ſhould) believed, in what it clearly teaches; to omit other uſes of reaſon, (about theological matters) which belong not to this place, where it may ſuffice to have ſhewn, that reaſon is not degraded from the dignity, that belongs to her, of perceiving and judging; though ſhe be obliged by her own dictates, to take in all the aſſiſtance ſhe can from experience, whether natural, or ſupernatural; and by the fuller accounts of things ſhe receives from thoſe informations, to rectify, if need be, her former and leſs mature judgments.

IN ſhort, thoſe, that cry up abſtracted reaſon, as if it were ſelf-ſufficient, exalt it in words; but we that addreſs reaſon to phyſical and

and theological experience, and direct it how to consult them, and take its informations from them, exalt it in effect; and reason is much less usefully served by the former sort of men, than by the latter; since whilst those do but flatter it, these take the right way to improve it.

I HOPE you will not imagine, that I have in the foregoing part of this letter said all that I could say pertinently. For being mindful of the brevity becoming an epistolary discourse, I omitted several arguments, that would have challenged their places in a treatise; and have but touched upon most of those I have mentioned; though reasonings of this kind are usually like tapestry, which loses much by being looked on whilst the hangings are folded up, which should be displayed to their full dimensions.

BUT having offered you some things, which perhaps you have not met with elsewhere; and having, though but transiently, touched upon the grounds of divers other considerable arguments, I hope, that your learning and sagacity will both supply what you will discern to have been omitted, and enforce what has been but intimated; and then I shall not despair, that what I have said may suffice to persuade you, that experimental philosophy may greatly assist a well-disposed mind, to yield an hearty and operative assent to the principles of religion. I am,

SIR,

Your most, *&c.*

The end of the FIRST PART.

REFLECTIONS

UPON A

Theological Distinction.

According to which it is said,

That some ARTICLES of FAITH are above Reason, but not against Reason.

In a LETTER to a Friend.

ADVERTISEMENT.

AFTER the author had begun the second part of his *Christian Virtuoso*, and made some progress in it, which he designed to continue till he had compleated it; he was obliged to leave the country, where he enjoyed some leisure, and to remove to London; where sickness, and business, and a multitude of visits he could not avoid receiving, did so distract him, that these remora's, added to the fertility of the subjects, that remained to be treated of, which he found much greater than he was at first aware of, made him lay aside the materials he had prepared for the second part, to a fitter opportunity, and comply with the occasions he had to publish some tracts, that required more. And it is for the like reasons, that having at present some other essays of a quite differing nature in the press, he is obliged to postpone his resuming and finishing the second part of the *Christian Virtuoso* (which will require more sheets than the former) for some longer time; though yet, to comply with the solicitations of the printer, he consents, both to let the first part come abroad, and (to make the book of a more decent size) add to it, by way of substitution, a discourse, that is of affinity enough to the other, upon the account of some of the points it handles, and more upon that of its scope; and that will not be ill received, if it have the good fortune to find the publick as kind to it, as private perusers have been.

For

For my learned Friend Mr. *H. O.*

SIR,

I. I CAN neither admire nor blame the curioſity you expreſſed, to receive ſome ſatisfaction about the important diſtinction, that is made uſe of in defence of ſome myſteries of the Chriſtian religion; namely, that *they are indeed above reaſon, but not againſt reaſon.* For though divers learned men have, eſpecially of late, employed it, yet I perceive you and your friends *N. N.* think, that they have not done it ſo clearly, as both to prevent the exceptions of infidels, or render them more groundleſs; and at leaſt, to obviate the ſurmiſes of thoſe others, who have been perſuaded to look upon this diſtinction but as a fine evaſion, whereby to elude ſome objections, that cannot otherwiſe be anſwered. And indeed, as far as I can diſcern by the authors, wherein I have met with it, (for I pretend not to judge of any others) there are divers that employ this diſtinction, few that have attempted to explain it, (and that I fear not ſufficiently,) and none that has taken care to juſtify it.

II. In order to the removal of the difficulties, that you take notice of, I ſhall endeavour to do theſe two things: 1. To declare in what ſenſe I think our diſtinction is to be underſtood. And 2. To prove, that it is not an arbitrary or illuſory diſtinction, but grounded upon the nature of things.

Though I do not deſire to impoſe my ſentiments on any man, much leſs on you; yet becauſe I, as well as others, have had ſome occaſions to make uſe of the diſtinction we are conſidering, I think myſelf obliged, before I go any further, to acquaint you in what ſenſe I underſtand it.

III. By ſuch things then in theology, as may be ſaid to be above reaſon, I conceive ſuch notions and propoſitions, as mere reaſon, that is, reaſon unaſſiſted by ſupernatural revelation, would never have diſcovered to us; whether thoſe things be to our finite capacities clearly comprehenſible or not. And by things contrary to reaſon, I underſtand ſuch conceptions and propoſitions, as are not only undiſcoverable by mere reaſon, but alſo, when we underſtand them, do evidently and truly appear to be repugnant to ſome principle, or to ſome concluſion of right reaſon.

IV. To illuſtrate this matter a little, I ſhall propound to you a compariſon drawn from that ſenſe, which is allowed to have the greateſt cognation with the underſtanding, which I preſume you will readily gueſs to be the ſight. Suppoſe then, that on a deep ſea, a diver ſhould bid you tell him, what you can ſee there; that, which you would anſwer, would be, that you can ſee into a ſea-green liquor, to the depth of ſome yards, and no further: ſo that if he ſhould further aſk you, whether you ſee what lies at the bottom of the ſea, you would return him a negative anſwer. If afterwards the diver letting himſelf down to the bottom, ſhould thence bring up and ſhew you oiſters, or muſcles with pearls in them; you would eaſily acknowledge, both that they lay beyond the reach of your ſight, and conſequently argued an imperfection in it; though but ſuch an imperfection, as is not perſonal, but common to you with other men, and that the pearls have the genuine colour and luſtre, that naturally belong to ſuch gems. But if this diver ſhould pretend, that each of theſe pearls he ſhews you, is as large as a tennis-ball, or ſome of them bigger than the ſhells they were encloſed in, and that they are not round but cubical, and their colour not white or orient, but black or ſcarlet; you would doubtleſs judge what he aſſerts to be not only (or not ſo properly) undiſcernible by your eyes, but contrary to the informations of them, and therefore would deny what he affirms. Becauſe, that to admit it would not only argue your ſight to be imperfect, but falſe and deluſory; though the organ be rightly qualified, and duly applied to its proper objects.

V. This illuſtration may give you ſome ſuperficial notion of the difference betwixt a thing's being above reaſon, and its being contrary to it. But this may better appear, if we conſider the matter more diſtinctly. And to offer ſomething in order to this, I ſhall beg leave to ſay, that in my opinion, the things, that may be ſaid to be above reaſon, are not all of one ſort, but may be diſtinguiſhed into two kinds, differing enough from each other.

VI. For it ſeems to me, that there are ſome things, that reaſon by its own light cannot diſcover; and others, that, when propoſed, it cannot comprehend.

VII. And firſt, there are divers truths in the Chriſtian religion, that reaſon, left to itſelf, would never have been able to find out, nor perhaps to have ſo much as dreamed of; ſuch as are moſt of thoſe, that depend upon the free will and ordination of God; as, that the world was made in ſix days, that Chriſt ſhould be born of a virgin, and that in his perſon there ſhould be united two ſuch infinitely diſtant natures as the divine and human; and that the bodies of good men ſhall be raiſed from death, and ſo advantageouſly changed, that the glorified perſons ſhall be like, or equal to the angels.

VIII. Of this kind of theological truths, you will eaſily believe, that it were not difficult for me to offer divers other inſtances; and indeed there are many truths, and more I think than we are wont to imagine, that we want mediums or inſtruments to diſcover, though, if they were duly propoſed, they would be intelligible to us: As for my part, when by looking on the ſtarry heaven, firſt with my naked eyes, and then with teleſcopes of differing lengths, I do not only deſcry more

and more ſtars, according to the goodneſs of the inſtruments I employed, but diſcovered great inducements to think, that there are in thoſe ineſtimably remote regions many celeſtial lights, that only the want of more reaching teleſcopes conceal from our ſight.

IX. And thus much I preſume you will cloſe with the more eaſily, becauſe it diſagrees not with the ſentiments of ſome few (for I dare ſay not many) orthodox divines. But I muſt take leave to add, that beſides theſe myſterious truths, that are too remote and hidden to be detected by human reaſon; there is another ſort of things, that may be ſaid to be above reaſon.

X. For there are divers truths delivered by revelation, (contained in the holy Scriptures,) that not only would never have been found out by mere natural reaſon; but are ſo abſtruſe, that when they are propoſed, as clearly as proper and unambiguous expreſſions can propoſe them in, they do nevertheleſs ſurpaſs our dim and bounded reaſon, on one or other of thoſe three accounts, that are mentioned in a Dialogue about things tranſcending reaſon; namely, either as not clearly conceivable by our underſtanding, ſuch as the infiniteneſs and perfections of the divine nature; or inexplicable by us, ſuch as the manner, how God can create a rational ſoul, or how this being an immaterial ſubſtance, it can act upon a human body, and be acted on by it; (which inſtance I rather choſe, than the creation of matter, becauſe it may be more eaſily proved;) or elſe aſymmetrical, or unſociable, that is, ſuch as we ſee not how to reconcile with other things, which alſo manifeſtly are, or are by us acknowledged to be true; ſuch as are the divine preſcience of future contingents, and the liberty, that belongs to man's will, at leaſt in divers caſes.

XI. It will not perhaps be improper to obſerve, on this occaſion, that as of things, that are ſaid to be above reaſon, there are more kinds than one; ſo there may be a difference in the degrees, or at leaſt the diſcernibleneſs of their abſtruſeneſs.

XII. For ſome things appear to ſurpaſs or diſtreſs our underſtandings, almoſt as ſoon as they are propoſed, at leaſt before they are attentively looked into; as what is ſaid to be infinite, either in extent or number. But there are other things, the notions whereof, as they firſt ariſe from the things conſidered in groſs, and as it were indefinitely, are ſuch, as do not choke or perplex our underſtandings; and are ſo far intelligible, that they may be uſefully employed in ordinary diſcourſe. But when we come to make a deep inſpection into theſe, and proſecute to the uttermoſt the ſucceſſive inferences that may be drawn from them, we reaſon ourſelves into inextricable difficulties, if not flat repugnancies too. And to ſhew you, that I do not ſay this gratis, be pleaſed to conſider with me, that we uſually diſcourſe of place, of time, and of motion, and have certain general indeterminate conceptions of each of theſe, by the help of which we underſtand one another, when we ſpeak of them; though, if we will look thoroughly into them, and attentively conſider all the difficulties, that may be diſcovered by ſuch an inſpection, we ſhall find our reaſon oppreſſed by the number and greatneſs of the difficulties, into which we ſhall argue ourſelves, or at leaſt may be argued by others; though theſe men, who do make ſuch ſhrewd objections againſt the hypotheſis we embrace, will hardly be able themſelves to pitch on any, that will not allow us to repay them in the ſame coin.

XIII. What has been newly ſaid may, I hope, aſſiſt us to clear a difficulty, or ſcruple, (about the diſtinction we treat of,) which, ſince it ſprung up in my own mind, may very probably occur alſo to your thoughts; namely, that if any theological propoſition be granted to ſurpaſs our reaſon, we cannot pretend to believe it, without diſcovering, that we do not ſufficiently conſider what we ſay; ſince we pretend to exerciſe an act of the underſtanding, in embracing ſomewhat, that we do not underſtand, nor have a notion of.

XIV. But on this occaſion we may juſtly have recourſe to a diſtinction, like that I have lately intimated. For in divers caſes, the notions men have of ſome things may be different enough, ſince the one is more obvious and ſuperficial, and the other more philoſophical or accurate. And of theſe two differing kinds of conceptions I have already offered ſome inſtances in the very differing notions men have of place and time; which, though familiar objects, I elſewhere ſhew to be each of them of ſo abſtruſe a nature, that I do not wonder to find *Ariſtole* himſelf complaining of the difficulty, that there is to give a clear and unexceptionable notion of place; nor to find ſo acute a wit as St. *Auſtin* ingenuouſly confeſſing his diſability to explicate the nature of time.

XV. And what is ſaid of the great intricacies, that incumber a deep ſcrutiny into theſe familiar objects of diſcourſe, will hold as to the diviſibility of quantity, as to local motion, and as to ſome other primary things, whoſe abſtruſeneſs is not inferior in degree, though differing as to the kinds of things, wherein it conſiſts.

XVI. By ſuch inſtances as theſe, it may appear, that without talking as parrots, (as your friends would intimate, that thoſe that uſe our diſtinction muſt do,) or as irrational men, we may ſpeak of ſome things, that we acknowledge to be on ſome account or other above our reaſon; ſince the notions we may have of thoſe things, however dim and imperfect, may yet be of uſe, and may be in ſome meaſure intelligible, though the things they relate to may, in another reſpect, be ſaid to tranſcend our underſtanding; becauſe an attentive conſiderer may perceive, that ſomething belongs to them, that is not clearly comprehenſible, or does otherwiſe ſurpaſs our reaſon (at leaſt in our preſent ſtate.)

XVII. Having diſpatched the objection, that required this digreſſion; I ſhall now ſtep again into the way, and proceed in it by telling

ing you, that any one appoſite inſtance may ſuffice to clear the former part of the expreſſion, that is employed, when it is ſaid, that a myſtery, or other article of faith, is above reaſon, but not contrary to it: for if there be ſo much as one truth, which is acknowledged to be ſuch, and yet not to be clearly and diſtinctly comprehenſible, it cannot juſtly be pretended, that to make uſe of the diſtinction we are treating of is to ſay ſomething, that is not intelligible, or is abſurd. And it will further juſtify the expreſſion quarrelled at, if we can make it appear, that it is neither impertinent or arbitrary, but grounded on the nature of things. And this I ſhall endeavour to do, by ſhewing, that though I admit two ſorts of things, which may be ſaid to be above reaſon, yet there is no neceſſity, that either of them muſt (always) be contrary to reaſon.

XVIII. As for the firſt ſort of things ſaid to ſurpaſs reaſon, I ſee not, but that men may be unable, without the aſſiſtance of a more knowing inſtructor, to diſcover ſome truths; and yet be able, when theſe are revealed or diſcovered to them by that inſtructor, both to underſtand the diſcloſed propoſitions by their own rational faculty, and approve them for true, and fit to be embraced. The intellect of man being ſuch a bounded faculty as it is, and naturally furniſhed with no greater a ſtock or ſhare of knowledge, than it is able by its own endeavours to give itſelf, or acquire; it would be a great unhappineſs to mankind, if we were obliged to reject, as repugnant to reaſon, whatever we cannot diſcover by our own natural light; and conſequently, to deny ourſelves the great benefits we may receive from the communications of any higher and more diſcerning intellect. An inſtance to my preſent purpoſe may be found among rational ſouls themſelves, though univerſally granted to be all of the ſame nature. For though a perſon but ſuperficially acquainted (for example) with geometry would never have diſcovered by his own light, that the diameter of a ſquare is incommenſurable to the ſide; yet when a ſkilful mathematician dextrouſly declares, and by a ſeries of demonſtrations proves that noble theorem, the diſciple, by his now inſtructed reaſon, will be able both to underſtand it, and to aſſent to it; inſomuch that *Plato* ſaid, that *he was rather a beaſt than a man, that would deny it.*

XIX. OTHER inſtances may be alledged to exemplify the truth newly mentioned. And indeed, there is not ſo much as a ſtrong preſumption, that a propoſition or notion is therefore repugnant to reaſon, becauſe it is not diſcoverable by it; ſince it is altogether extrinſical and accidental to the truth or falſity of a propoſition, that we never heard of it before; or that we could never have found it out by our own endeavours; but muſt have had the knowledge of it imparted to us by another. But then this diſability to find out a thing by our own ſearch doth not hinder us from being able by our own reaſon both to underſtand it when duly propoſed, and to diſcern it to be agreeable to the dictates of right reaſon. To induce you to aſſent to the latter part of this obſervation, I ſhall add, that theſe intellectual aſſiſtances may oftentimes not only enlighten, but gratify the mind, by giving it ſuch informations, as both agree with its former maimed or imperfect notices, and compleat them. When, for example, an antique medal, half conſumed with ruſt, is ſhewed to an unſkilful perſon, though a ſcholar, he will not by his own endeavours be able to read the whole inſcription, whereof we ſuppoſe ſome parts to be obliterated by time or ruſt, or to diſcover the meaning of it. But when a knowing medaliſt becomes his inſtructor, he may then know ſome (much defaced) letters, that were illegible to him before; and both underſtand the ſenſe of the inſcription, and approve it as genuine and ſuitable to the things, whereto it ought to be congruous. And becauſe divers philoſophical wits are apt, as well as you, to be ſtartled at the name of myſtery, and ſuſpect, that becauſe it implies ſomething abſtruſe, there lies hid ſome illuſion under that obſcure term; I ſhall venture to add, that agreeably to our doctrine we may obſerve, that divers things, that relate to the old teſtament, are in the new called myſteries, becauſe they were ſo under the Moſaick diſpenſation; though they ceaſe to be ſo, now that the apoſtles have explained them to the world. As the calling of the Gentiles into the church of God is by their apoſtle called a myſtery; becauſe, to uſe his phraſe, it "had been hid from "ages and generations;" though he adds, "but now it is made manifeſt to his ſaints." And the ſame writer tells the *Corinthians*, that he "ſhows them a myſtery," which he immediately explains, by foretelling, that all pious believers ſhall not die, becauſe that "thoſe, "that ſhall be found alive at the coming of "Chriſt, ſhall not ſleep, but be changed;" as the other "dead ſhall be raiſed incorruptible." Which ſurpriſing doctrine, though, becauſe it could not be diſcovered by the light of nature, nor of the writings of the old teſtament, he calls a myſtery, yet it is no more ſo to us, now that he hath ſo expreſsly foretold it, and therefore declared it.

Coloſſ. i. 26. Epheſ. iii. 3, 5, 6. 1 Corinth. xv. 51, 52.

XX. OTHER inſtances I content myſelf to point at in the margin, that I may paſs on to confirm the obſervation I formerly intimated; that divers things, which the ſcripture teaches beyond what was known, or (in probability) are diſcoverable by natural light, are ſo far from being againſt reaſon, by being (in the ſenſe declared) above it, that theſe diſcoveries ought much to recommend the ſcripture to a rational mind; becauſe they do not only agree with the doubtful or imperfect notions we already had of things, but improve them; if not compleat them. Nay, I ſhall venture to add, that theſe intellectual aids may not ſeldom help us to diſcern, that ſome things, which not only are above reaſon, but at firſt ſight ſeem to be againſt it, are really reconcileable to reaſon, improved by

See Mat. xiii. 11. Epheſ. v. 31.

by the new helps afforded it by revelation. To illuſtrate this by a philoſophical inſtance; when *Galileo* firſt made his diſcoveries with the teleſcope, and ſaid, that there were planets that moved about *Jupiter*; he ſaid ſomething, that other aſtronomers could not diſcern to be true, but nothing that they could prove to be falſe. And even when ſome revelations are thought not only to tranſcend reaſon, but to claſh with it; it is to be conſidered, whether ſuch doctrines are really repugnant to any abſolute catholick rule of reaſon, or only to ſomething, which ſo far depends upon the meaſure of acquired information we then enjoy, that, though we judge it to be irrational, yet we are not ſure, that the thing, this judgment is grounded on, is clearly and fully enough known to us. As to reſume the former example, when *Galileo*, or ſome of his diſciples, affirmed *Venus* to be ſometimes horned like the moon; though this aſſertion were repugnant to the unanimous doctrine of aſtronomers, who thought their opinion very well grounded on no leſs a teſtimony than that of their own eyes; yet in effect the proof was incompetent, becauſe their unaſſiſted eyes could not afford them ſufficient information about this caſe. And ſo when *Galileo* ſpoke of hills and valleys, and ſhadows in the moon, they were not ſtrait to reject what he taught, but to have, if not a kind of implicit faith, yet a great diſpoſition to believe what he delivered, as upon his own knowledge, about the figure and number of the planets. For they knew, that he had, and had already ſucceſsfully made uſe of a way of diſcovering celeſtial objects, that they were not maſters of, nor therefore competent judges of all the things, though they might well be of many, that he affirmed to be diſcoverable by it. And though they could not ſee in the moon what he obſerved, (vallies, mountains, and the ſhadows of theſe) yet they might juſtly ſuſpect, that the difference of the idea that they framed of that planet, and that which he propoſed, might well proceed from the imperfection of their unaided ſight; eſpecially conſidering, that what he ſaid of the differing conſtitution of what is there analogous to ſea and land, did rather correct and improve, than abſolutely overthrow their former notices. For he allowed the ſpots they ſaw to be darker parts of the moon, and gave cauſes of that darkneſs, which their bare eyes could not have led them to any ſuch knowledge of. And the non-appearance of the mountainous parts of the moon in that form to the naked eye might well be imputed to the great diſtance betwixt them and us, ſince at a far leſs diſtance ſquare towers appear round, *&c.*

XXI. It now remains, that I ſay ſomething, that may both make ſome application of the form of ſpeech hitherto diſcourſed of, and afford a confirmation of the grounds, whereon I think it may be juſtified. This I am the rather induced to do, becauſe I expect it will be objected, that he that acknowledges, that the thing he would have us believe, tranſcends our reaſon, has a mind to deceive us, and procures for himſelf a fair opportunity to delude us, by employing an arbitrary diſtinction, which he may apply as he pleaſes.

XXII. But to ſpeak firſt a word or two to this laſt clauſe, I acknowledge, that ſuch a diſtinction is capable enough of being miſapplied; and I am apt to think, that by ſome ſchool-divines, and others, it has been ſo. But ſince there are other diſtinctions, that are generally and juſtly received by learned men, and even by philoſophers themſelves, without having any immunity from being capable to be perverted; I know not, why the diſtinction we are conſidering ſhould not be treated as favourably as they. And however, the queſtion at preſent is not, whether our diſtinction may poſſibly be miſapplied by raſh or impoſing men, but whether it be grounded on the nature of things. To come then to the thing itſelf; I conſider, that for an opinion to be above reaſon, in the ſenſe formerly aſſigned, is ſomewhat, that (as was noted in reference to the firſt ſort of things that ſurpaſs it) is extrinſical and accidental to its being true or falſe. For to be above our reaſon is not an abſolute thing, but a reſpective one, importing a relation to the meaſure of knowledge, that belongs to the human underſtanding, ſuch as it is ſaid to tranſcend: and therefore it may not be above reaſon, in reference to a more enlightened intellect, ſuch as in probability may be found in rational beings of an higher order, ſuch as are the angels, and without peradventure, is to be found in God, whom when we conceive to be a being infinitely perfect, we muſt aſcribe to him a perfect underſtanding and boundleſs knowledge. This being ſuppoſed, it ought not to be denied, that a ſuperior intellect may both comprehend ſeveral things, that we cannot, and diſcern ſuch of them to be congruous to the fixed and eternal ideas of truth, and conſequently agreeable to one another, as dim-ſighted mortals are apt to ſuſpect, or to think to be ſeparately falſe, or, when collated, inconſiſtent with one another. But to launch into this ſpeculation would lead me farther than I have time to go. And therefore I ſhall content myſelf to offer you one argument, to prove, that of things, that may be ſaid to be above reaſon, in the ſenſe formerly explained, it is no way impoſſible, that even ſuch an one ſhould be true, as is obnoxious to objections not directly anſwerable. For I conſider, that of things above reaſon, there may be ſome, which are really contradictory to one another, and yet each of them is maintainable by ſuch arguments, as very learned and ſubtile men do both acquieſce in and enforce, by loading the embracers of the oppoſite opinion with objections they cannot directly anſwer.

XXIII. This I take to be manifeſt in the caſe of the controverſy about the endleſs diviſibility of quantity, as ſuppoſe of a ſtrait line. For many eminent mathematicians, and a greater number of naturaliſts, and in particular almoſt all the Epicureans, and other atomiſts, ſtiffly maintain the negative. The affirmative

affirmative is nevertheleſs aſſerted, and thought to be mathematically demonſtrated by *Ariſtotle* in a peculiar tract; and both by his ſchool, and by ſeveral excellent geometricians beſides. And yet in reality the aſſertions of theſe two contending parties are truly contradictory; ſince of neceſſity a ſtrait line propoſed muſt be, at leaſt mentally, diviſible, into parts, that are themſelves ſtill further diviſible; or it muſt not be ſo, and the ſubdiviſions muſt at length come to a ſtop. And therefore one of the oppoſite opinions muſt be true. And it is plain to thoſe, that have, with competent ſkill and attention, impartially examined this controverſy, that the ſide, that is pitched upon, which ſoever it be, is liable to be expoſed to ſuch difficulties, and other objections, as are not clearly anſwerable, but confound and oppreſs the reaſon of thoſe, that ſtrive to defend it.

XXIV. I HAVE, Sir, the more largely diſcourſed of the foregoing diſtinction, not only becauſe I did not find myſelf to have been prevented by others, but becauſe I look upon the explaining and juſtifying of it to be of importance, not alone to the defence of ſome myſteries of the Chriſtian religion, but (what perhaps may have eſcaped your obſervation) of ſome important articles of natural theology itſelf. For though natural religion taught divers heathen philoſophers, ſuch truths as theſe, *viz.* the production of the rational ſoul or mind, which is an immaterial ſubſtance; the formation of the world out of the univerſal matter, though this action required, that an incorporeal ſubſtance gave motion to a body; that God knows men's thoughts and intentions, how carefully ſoever they ſtrive to hide them; and that God foreknows the events of the free actions of ſuch men, as are not to be born theſe many ages: though, I ſay, theſe and ſome other ſublime truths were by divers men embraced before the goſpel began to be preached; yet when I attentively conſider, how hard it is to conceive the modus of theſe things, and explain how ſome of them can be performed; and alſo, how ſome of the divine attributes, as eternity, immenſity, omnipreſence, and ſome others, belong to God; and how ſome actions, as the moving of bodies, and the creation of human minds, with all their noble faculties, are exerciſed by him: when I conſider ſuch things, I ſay, I acknowledge, that, to my apprehenſion, there are ſome doctrines allowed to have been diſcovered by the mere light of nature, that are liable to ſuch objections from phyſical principles, and the ſettled order of things corporeal, as, if they be urged home, will bring thoſe, that are ingenuous, to acknowledge, that their intellects are but dim and imperfect, and indeed diſproportionate to the ſublimeſt and moſt myſterious truths; and that they cannot perfectly comprehend them, and anſwer all the difficulties that incumber them, though they find themſelves obliged to admit them, becauſe of the weighty poſitive reaſons, that recommend thoſe heteroclite truths to their aſſent.

XXV. IF you ſhould now tell me, that after all I have ſaid, it is plain, that the queſtioned diſtinction, if it were granted, might be of very bad conſequence, as affording ſhelter to any unintelligible ſtuff, that ſome bold enthuſiaſt, or conceited philoſophizer, may obtrude under the venerable title of a myſtery, above the juriſdiction of reaſon; and that, though the diſtinction were admitted, it would not be a good proof of any diſputed article of the Chriſtian religion: if, I ſay, this ſhall be objected, I ſhall anſwer, (what in part is intimated already) that I do not deny, but that our diſtinction is liable to be ill employed; but that this is no other blemiſh than what is common with it to divers other diſtinctions, that are without ſcruple admitted, becauſe they are uſeful, and not rejected, becauſe they have not the privilege, that they can never be miſapplied. And therefore, both in reference to thoſe diſtinctions, and to that we have been treating of, it becomes men to ſtand upon their guard, and ſtrictly examine, how far the notion, or doctrine, propoſed as a myſtery, does require, and is entitled to the benefit of this diſtinction. I ſhall alſo readily grant the greateſt part of the ſecond member of your objection. For I think it were great weakneſs in a Chriſtian, to urge our diſtinction as a poſitive proof; ſince, though it be extrinſical to an abſtruſe notion, to be, or not to be, above reaſon, (as was juſt now noted to another purpoſe;) yet generally ſpeaking, that abſtruſeneſs is leſs fit to bring credit to a conception, or a doctrine, than it is to make it to be diſtruſted. Nor are Chriſtians ſuch fond diſcourſers, as to pretend, that ſuch an article of religion ought to be believed, becauſe it is above reaſon, as if that were a proof of its truth; but only, that if it be otherwiſe well proved, it ought to be believed, notwithſtanding its being above reaſon.

XXVI. AND this I ſhall repreſent in favour of thoſe, that believe theſe abſtruſe articles, that are clearly revealed in the ſcripture, upon the authority of the divine revealer, (who never deceives others, nor can be himſelf deceived,) that ſince, as we have lately ſhewn by the contradictory opinions about the diviſibility of quantity, ſome doctrines muſt be true, whoſe difficulties do not appear to be ſurmountable by our dim reaſon; and ſince the perfectneſs of God's knowledge permits us not to doubt, but that he certainly knows which of the two contending opinions is the true, and can declare ſo much to men; it would not be a ſure ground of rejecting a revealed article, to alledge, that it is encumbered with confounding difficulties, and liable to many and weighty objections.

XXVII. AND, (to add ſomewhat, that may help to defend ſome truths of natural, and others of revealed religion) that a thing may be rationally aſſented to upon clear poſitive evidence, though we cannot directly anſwer the objections, that a ſpeculative and ſubtil wit may deviſe againſt it, is a truth, which, as important as it is to religion in general, and the Chriſtian religion in particular, I think one

one may ſufficiently manifeſt by this one inſtance, that becauſe we can walk up and down, and ſo remove our bodies from place to place; by this one argument, I ſay, we are juſtly ſatisfied, that there is a local motion in the world, notwithſtanding all the ſpecious and ſubtil arguments, that *Zeno* and his followers have employed to impugn that truth: againſt which they have alledged ſuch difficulties, as have not only puzzled and perplexed, but (for aught yet appears) nonplus'd the ancient philoſophers, and, I doubt, thoſe moderns too, that have attempted to give clear ſolutions of them.

XXXVIII. If now, Sir, we look upon what hath hitherto been diſcourſed, I hope you will allow me to gather thence the concluſion I aim at, which is, that there is no neceſſity, that every notion or propoſition, that may be found delivered in the holy ſcriptures, that ſurpaſſes our reaſon, muſt therefore be contradictory to it: and that in caſe the Chriſtian religion be true, and its myſteries or other articles divinely revealed, it is not enough for the confution of any of them, to reject the expreſſion, that it is above reaſon, but not contrary to it; as if it involved an unintelligible or groundleſs diſtinction: for though this will not evince the truth of a myſtery, ſince that muſt be eſtabliſhed upon its proper grounds and arguments; yet it will keep it from being therefore abſurd or falſe, becauſe it tranſcends our reaſon: ſince to do ſo may belong almoſt indifferently to a chimerical notion, and a myſterious truth. And if the expreſſion be employed to juſtify any thing, that, though ſtiled a myſtery, is but a pretended one, the error will lye, not in the groundleſſneſs of the diſtinction, but the erroneouſneſs of the application. I am,

SIR,

Your moſt, *&c.*

GREATNESS of MIND

PROMOTED BY

CHRISTIANITY.

In a LETTER to a Friend.

The FIRST PART.

To my honoured Friend Sir *R. M.*

SIR,

I DO not wonder, that a great ſoul, like yours, ſhould enquire, what aſpect religion, and particularly that of Chriſtians, has upon *greatneſs of mind:* but I confeſs, I ſomewhat marvel, that you ſhould be put upon the enquiry by the ſuggeſtions of ſuch a libertine as Mr. *N. N.*'s confidently pretending, that his atheiſtical and ſenſual principles are much more friendly, than the doctrines of Chriſtianity, to a noble frame of mind. Wherefore I dare not permit the ſenſe I have of my own weakneſs, how great and juſt ſoever, to keep me from preſenting you with my thoughts; and the rather, becauſe I preſume you are not indiſpoſed to receive a ſatisfaction in this point, ſince you ſeem to expect it from a pen, that is no better than mine; which, you well know, muſt not be on this occaſion aſſiſted by the arguments and ornaments, that the fine ſentences of the fathers, and other divines and humaniſts, might afford to a perſon, that were at leiſure, and furniſhed with a library. Yet I ſhall not much either excuſe or deplore my being ſo ill accommodated for the taſk you impoſe upon me; becauſe as you ſeem to deſire but my own thoughts, ſo I know not, whether common place-books would afford me any great aſſiſtance on ſo uncommon a theme; and, I confeſs, that when the matter will bear it, I, as well as you, do leſs care for authorities, eſpecially taken from diſcourſes, deſigned rather to perſuade than prove, in compariſon of thoſe arguments, that are ſuggeſted by a due conſideration of the nature of the thing. But yet, I preſume, you will readily give me leave to do that frequently enough, which your friend perhaps will call preaching. For beſides that your deſires, and my haſte, confine me to the bible and

my own thoughts; the frequent citation of texts of holy ſcripture is exacted by the nature of the queſtion I am to handle: it being neceſſary for the evincing of the doctrines of Chriſtianity, not to be inconſiſtent with greatneſs of mind, that we as well conſider, what thoſe doctrines are, which ſure will be beſt declared by the ſcriptural texts that contain them, as what are the attributes of greatneſs of mind.

CHAP. I.

TO proceed then with ſome method, as well as much brevity, I conceive it will be no unfit way to come to a reſolution in our enquiry, if I firſt ſet down and enumerate the chiefeſt things, that in the eſtimation of intelligent men do, as if they were ſo many ingredients, make up what we call magnanimity or greatneſs of mind, that not being a ſingle ſtar, but a conſtellation of elevated and radiant qualities; and then ſhew, that religion, eſpecially that of the Chriſtians, is at leaſt conſiſtent with each of theſe, if it do not alſo promote it. But in this enumeration, though I ſhall, *ex abundanti*, take in ſome qualities, that are not eſſential to greatneſs of mind, but rather acceſſions to it; yet I ſhall not ſcrupulouſly diſtinguiſh thoſe things, that are neceſſary to compleat it, and thoſe that are partly ſome of them ſigns, and ſome of them effects of it; hoping from your equity, that theſe additional things will be thought to make full amends, if through haſte or miſtake I ſhould chance to have omitted any property, that you may judge to belong to the true notion of generoſity.

I SHALL, in the following diſcourſe, take it for granted (and I hope I need not tell you, that I do ſo) that as we think not maſons, but jewellers, fit to judge of the genuineneſs and value of precious ſtones; ſo you will allow me to take the notion and meaſures of greatneſs of mind, not from the opinions of the injudicious vulgar, but the judicious eſtimates of reaſon, improved by philoſophy, and enlightened by natural theology.

I KNOW, the undiſcerning multitude, whoſe judgment ſeems rather lodged in the eye than in the brain, when they hear men name greatneſs of mind, are apt to fancy ſomething, that, like the coronation of a king, is attended with pomp and ſplendor, and a numerous train of gazers, and the loud acclamations of the people. And, at leaſt, when mention is made of an heroick ſoul, they imagine, that it cannot be but in a great commander, like a Roman emperor, or a Tartarian general, that leads and defeats armies, and deſolates whole countries, and leaves them peopled only with carcaſſes. But reaſon and religion, that look on human things with eyes untroubled by thoſe pompous outſides, that dazzle the vulgar, can eaſily ſee a vaſt difference betwixt greatneſs of fortune and greatneſs of mind. And not only Chriſtianity teaches, that 'God, who is no 'Προσωπολήπτης, reſpecter of perſons,' *Acts* x. 34. 2 *Sam.* xiv. 14. 'ſees not perſons as man ſees 'them;' and that 'a thing, that is ſublime 'amongſt men, may be an abomination to him.' But philoſophers themſelves can eaſily diſtinguiſh betwixt that real greatneſs, that truly belongs to the man, and that theatrical one, that fortune may have annexed to his condition. And, though they pay a peculiar honour and reſpect to great virtue in ſovereigns, rather than in ſubjects, becauſe in the former it is more diffuſively beneficial, and cannot laſt without reſiſting ſtronger temptations; yet, they do not think, that a great empire always either finds, or makes, a great ſoul. And if dignities, how high ſoever, be attained by mean ſubmiſſions, or weak actions, they think this extrinſecal greatneſs can no more make a mean ſoul great, than high ſtilts can make a dwarf a proper man. Perhaps they look upon many, who, for making a great buſtle and noiſe in the world, are, by themſelves, and the ſhallow vulgar, thought great ſpirits, but as gnats, that are in themſelves ſmall and worthleſs creatures, and are really conſiderable for nothing, ſave the noiſe and the ſtings wherewith they are able to diſturb mens reſt. That lucky monarch, that overcame ſo great a part of the then known world, and conquered countries, faſter than one would have thought he could have travelled over them, has this character given of his ſtupendous exploits by the Roman hiſtorian, that all he had done was, 'that he durſt well 'deſpiſe deſpicable things.' And in a poet of the ſame nation this is his elogy,

Fœlix terrarum prædo, non utile mundo
Editus exemplum.

AND if ſuch perſons as they had ſo little reſpect for ſo great a monarch, that was a lawful ſovereign; what liberty, think you, do philoſophers allow themſelves, who ſo little value the favourites of fortune for their being ſo, that even ſuch as thoſe proſperous uſurpers, *Phocas*, *&c.* that her fondneſs, and the applauſe of a multitude (as blind, perhaps, as ſhe is painted) have ſeated in the throne? Philoſophers, in their thoughts, do as well doom to a ſcaffold, as religion does to hell. And certainly, true greatneſs of mind muſt be ſomething, that both reſides in the ſoul, and is perfective of it; neither of which properties belong to any thing, that fortune can beſtow: and all that outward greatneſs can do is not to make a ſoul great, but to afford one, that is, the opportunity of ſhewing itſelf to be ſo. And all theſe ſubmiſſions and reſpects, that cuſtom, or fear, or intereſt make men pay to thoſe, whom only their titles, or their places, or their power, makes great ones, do as little argue or increaſe the real worth of thoſe envied perſons, as the ſtanding for more than formerly in an account turns a braſs counter into ſilver or gold. And as no leſs ſkill in arithmetick is required, to multiply, *&c.* a thouſand farthings than a thouſand guineas; though one of the latter be worth almoſt a thouſand of the former; ſo the ordering or diſpoſing of all things according to

the beſt rules, and after the beſt manner they are capable of, may argue no leſs greatneſs of mind in a private man, than is exerciſed by a great monarch, in thoſe actions, that attract the eyes, and buſy the tongues, of nations. And as it uſually ſpeaks a man a better artiſt to make a pocket-watch, than a great town-clock, all the advantage the latter has of the former conſiſting in the greatneſs of the matter that is wrought, and not that of the ſkill, that is diſplayed; ſo it ſometimes happens, that thoſe productions of virtue argue a greater ſoul, that make by far a leſſer ſhew and noiſe. And you may remember, not only that *Socrates*, notwithſtanding his private, and even neceſſitous, condition, was by the oracle preferred to all the Grecians, when *Greece* was the theatre of generous minds; but, that a far truer oracle than that of *Delphos* pronounced the poor widow's mind, and circumſtances, to have made her mite a greater liberality, than all that the rich man had beſtowed upon the Corban. And it is the ſentence of no worſe a judge than *Solomon*.

Mark xii. 43. Prov. xvi. 32.

LET us not then, from the mean notions of the vulgar, and the fond opinions of common ſouls, take our eſtimates of ſo ſublime and extraordinary a quality, as greatneſs of mind. For many things, to which they give not only their approbation but their applauſe, are, and ought to be, as little eſteemed, if they be condemned by the wiſe, as a piece of braſs money, that has long paſſed current among the people, ought to be thought good gold, when refiners and ſay-maſters have declared it counterfeit. And if you aſk me, what notion then of greatneſs of mind I am willing to allow, I ſhall freely tell you, that, in my apprehenſion, the man, that has a great mind, is he, that uſes his utmoſt moral diligence to find out what are the beſt things he can do, and then, without being deterred by dangers, or diſcouraged by difficulties, does reſolutely and ſteadily purſue them, as far as his ability and opportunities will ſerve; and this out of an internal principle of love to God and man, and with a ſincere aim to glorify the one, and benefit the other.

CHAP. II.

BUT, before I deſcend to particulars, it will not be amiſs to take notice of one conſideration, that may, in general, make it probable, that the Chriſtian Religion is rather favourable, than oppoſite, to true magnanimity. That this argument may make ſomewhat the more impreſſion, I ſhall, though very briefly, obſerve, that the aſpects, both of the author, the rules, the aims, or ſcopes, and the rewards of virtue, as it is recommended by Chriſtianity, have a great and direct tendency to elevate it, and make it heroick.

AND firſt, the prime author of the doctrine of the goſpel being God himſelf, who both knows man perfectly, and is mentioned in ſcripture as a φιλάνθρωπος, or lover of mankind; it is but reaſonable to ſuppoſe, that the doctrines and laws he cauſed to be ſolemnly delivered to mankind, and confirmed by miracles, and whoſe ſyſtem is, in the Apocalypſe, honoured with the title of the ever-laſting goſpel, (*i. e.*) not to be ſucceeded by a more perfect inſtitution, as the Moſaick law was by that; ſhould be fitted to beget and advance ſolid and ſublime virtue, and be, more than any other inſtitution, perfective of human nature.

Tit. iii. 4.

Revel. xiv. 6.

NEXT, the rules, and (if there be any ſuch) the counſels of the Chriſtian religion require, and tend to, extraordinary degrees of virtue. The divine legiſlator, being able to look into the hearts of men, makes his laws reach thoſe, and thoſe principally too. The "loving God with all our hearts, with "all our minds, *&c.* and our neighbour as "our ſelves," as comprehenſive as thoſe two grand principles of virtue are, is by our Saviour made the ſummary of the moral law, and adopted into the goſpel; the "cleanſing our "ſelves from all filthineſs, both of fleſh and "ſpirit;" and the "abſtaining from all kind, "or appearance, of evil," are the negative parts of the Chriſtian's duty; and for the poſitive parts, we are plainly told, that, "unleſs "our righteouſneſs exceed that" boaſted one "of the ſcribes and phariſees, we ſhall not "enter into the kingdom of heaven." We are urged to "grow in grace, to add to our "faith, virtue," and to that, a whole train of excellent qualities. And, for fear any ſuch thing ſhould be thought to be purpoſely omitted, becauſe left unmentioned, this general exhortation is given us; "finally, my bre-"thren, whatſoever things are true, *&c.*". But there is yet a more aſpiring path of virtue traced us out in the goſpel, where it propoſes to us the example of Chriſt, as one, whoſe ſteps we are to tread in: for not only that divine perſon never committed any ſin, neither was guile found in his mouth; but the ſupreme and omniſcient judge, God himſelf, declared, by a voice from heaven, his full approbation, both of his perſon, and his doctrine, when he ſaid, "this is my beloved "ſon, in whom I am well pleaſed, hear ye "him." And his ſinleſs life, which was a living law, did not only ſurpaſs the examples, but even the precepts and the idea's too, of the heathen moraliſts and philoſophers, as may be elſewhere ſhewn. And the becoming a ſerious diſciple of ſo perfect and divine a teacher does itſelf ſo engage a man to renounce his former vices, that when St. *Paul* had diſſuaded his Romans from divers other vices, inſtead of exhorting them to the contrary virtues in particular, he only deſires them, in general, "to put on the Lord Jeſus "Chriſt," as a comprehenſive duty, which contained in it all tho virtues, he declined to enumerate.

2 Cor. vii. 1.

1 Theſſ. v. 22.

Matth. v. 20.

2 Pet. iii. 18. i. 5.

Phil. iv. 8.

1 Pet. ii. 22.

Mat. xvii. 5.

Rom. xiii. 14.

THIRDLY, but though he calls us to high degrees of virtue, yet he does not to unattainable ones: for, though philoſophy wiſely forbore, though not always to commend, yet to enjoin things diſproportionate to human infirmities; yet he may well be allowed to engage us to more than human virtues, that by his

his divine aſſiſtances, if they be duly ſought, is always ready to enable us to acquire and practiſe them. Of his "fulneſs," ſays St.
John i. 16. *John*, "we have all received, and grace for "grace;" (*i. e.*) either graces anſwerable to his, as the faculties of a child's mind are to thoſe of a perfect man; or, grace upon grace, (*i. e.*) an accumulation of graces heaped upon one another; which may keep you from wondring, that St. *Paul* ſhould dare to ſay,
Phil. iv. 13. "that he could do all things through Chriſt, "that ſtrengthened him." And where his invitations meet with an honeſt and a willing mind, his commands do not only chalk out the way, but give ſtrength to walk in it; and he uſually does, by his ſpirit, ſuch a kind of work, as he ſometimes did miraculouſly by his power, when he at once bid, and enabled
Matt. 9. 6. a paralytick perſon, that wanted ſtrength to ſtir from his bed, to riſe and walk; and
Matt. xiv. 29. when, having commanded St. *Peter* to walk to him upon the ſea, he enabled him ſecurely to tread upon the waves; thereby approving and rewarding the excellent notion that diſciple had, that the command of Chriſt was a ſufficient cauſe to put him upon action, though a miracle were requiſite to carry him through with it.

FOURTHLY, the rewards propoſed to virtue and piety by the Chriſtian religion do exceedingly tend to animate and heighten them, whether we conſider the recompences the goſpel propounds in this life, or thoſe that it promiſes in the next. The great preſent rewards of virtue are, you know, the approbation of good men, and the applauſe of a man's own conſcience. The firſt of theſe is as well attainable by Chriſtian heroes, as by any other; for virtue loſes neither its worth, nor amiableneſs by being baptized; and though in ſome times and places leſſer degrees of it may be diſregarded, or traduced, yet, generally ſpeaking, the greater degrees of it will either invite or extort mens eſteem. Among the Roman perſecutors, the exemplary lives and conſtancy of the primitive Chriſtians brought it to be proverbially ſaid, *that ſuch a man was a good man, ſaving that he was a Chriſtian*; and, *Soli Chriſtiani mortis contemptores* was uſually in heathens mouths. There are divers qualities, and thoſe more preſſed by the Chriſtian, than any other inſtitution, that have in them ſo much of native lovelineſs, that St. *Paul* might juſtly ſay of
Rom. xiv. 18. them, "that he that exerciſes himſelf in "them," is generally ſpeaking, "both accept-"able to God, and approved by men." Nor did thoſe virtues, that recommended the great *Conſtantine*, whilſt he was a Gentile, loſe their luſtre, or the veneration they procured him, when he turned Chriſtian, and practiſed them with higher aims, than that of ſatisfying himſelf, and pleaſing his people.

AND as for the reward of a good conſcience, which was able to make *Hercules* undergo all his labours, and made all the other heroes of the Gentile world; I think, it will not be doubted, but that this inward recompence is received, not only without any defalcations, but with great improvements, by him, whoſe virtues flow from religion. For to him the applauſes of conſcience may well be more acceptable than all the various ſorts of muſick, that ſolemnized the dedication of *Nebuchadnezzar*'s golden image, ſince in him
Dan. iii. 7. conſcience does not, as in mere natural men, act only the part of a domeſtick judge, but that of a delegate from God himſelf; and its abſolutions are leſs welcome, as they are approbations of reaſon, than as they are the pledges of God's acceptance, and of that higher reward, that will be conſequent to it in the life to come.

FOR theſe joys, that are placed on the other ſide of the grave, are much the nobleſt part of the recompence of virtue, and proportionable incitements to the practice of it; and yet on the account of future rewards, the Chriſtian has much greater motives to heroick virtue, than the heathen moraliſt or philoſopher. For the poſthume ſtate of man is ſo dim and uncertain, that we find even the greateſt men among the heathens ſpeak very doubtfully, and not without ifs and ands of a future ſtate, and much more of a future happineſs, as may be inſtanced in *Socrates*, *Cyrus*, *Seneca*, and many others; ſo that they rather ſeemed to have wiſhed, or hoped, than believed their future felicity: and, I fear, that many of them, finding that happy ſtate deſcribed chiefly by the poets, reckoned it among poetick fictions. And thoſe, that did, though but waveringly, expect recompences in the life to come, had but poor and mean ideas ſuggeſted to them of it; the hopes they were entertained with being of fortunate iſlands and the Elyſian fields, which are not ſo tranſcendent, as to make a diffident man very forward to quit the gardens of *Epicurus*, that he has here in poſſeſſion, upon the doubtful hopes of other gardens in *Elyſium*. Whereas to excite the Chriſtian to an heroick degree of virtue, he is not allowed to hope, but commanded to be entirely confident of paſſing out of this world into a place, to which the poets Elyſium is much more inferior, than the poſſeſſion of a garden is to that of an empire. To attempt the deſcription of that celeſtial happineſs, would be, contrary to my inclination, to launch out into a common place; and were a work, that if my haſte did not, my diſability would diſſuade me from: and therefore, though it be a ſtate made up of the confluence of all ſorts of things rationally deſirable, yet having only ſaid in general of all the other goods, that it comprizes, that the ſcripture tells us, "that
"eye has not ſeen, nor ear heard, nor the
1 Cor. ii. 9. "heart of man conceived, what God has laid "up for them that fear him;" I ſhall particularly take notice only of thoſe parts of this ineſtimable reward, that may peculiarly concern my preſent purpoſe, by being the chief things, that heroick ſouls are wont to aſpire to, a good name, honour, and dignity.

To have a good name for good actions, cannot but be a very deſirable thing, the applauſe of wiſe and good men being a loud

eccho

eccho from without, that by repeating it confirms the approbation given by the conſcience within. But though to do virtuous and worthy actions be the beſt and likelieſt way of acquiring a good name, yet it is not a certain one: for ſuch is the ignorance, the malice, or the enmity of a great many, that no man is ſure to eſcape being miſrepreſented or traduced, as we ſee, that the ſublimity, the brightneſs, and the regular courſes of the ſtars themſelves, could not hinder wanton poets, or fanciful aſtronomers, from giving thoſe luminous conſtellations the names not only of the nobler beaſts, as the lion, the eagle, and the whale; but even of animals, that lye under an ill name, as the dog, the goat, and ſcorpion. And though it be true, that oftentimes innocency long clouded does, like lightning, break out at laſt; yet oftentimes too that happens not, till malice and envy are dead, becauſe the maligned perſon is ſo; by which means he does not live to know he is juſtified, and many, if not all of thoſe miſinformed men are dead and gone, for whoſe good opinion he was chiefly concerned. But though the Chriſtian may, as well as any other, be traduced by calumny, which often ſerves good men, (as the heathen perſecutors did the martyrs, when they expoſed them to the people's view, clothed in the ſkins of beaſts, to make them hideous and hateful;) yet he is juſtly cheered by the aſſurance he has, that there will come a time, when oppreſſed and disfigured innocency ſhall ſhine forth and triumph, and his good name, as well as his body, ſhall have a glorious reſurrection, even in the ſight of his accuſers and enemies, and of all thoſe, whom their ſlanders did either prevail with, or ſtartle. For at that great and general aſſize, to which there ſhall be a far greater confluence, than the Aſſyrian monarch drew to the plains of *Babylon*, the heroick diſciples of the apoſtles will be able to ſay, upon happier terms than the apoſtles themſelves did here below, that they are made a "ſpectacle "to God, to angels, and to men." And in that illuſtrious aſſembly of the "firſt born, "whoſe names are written in heaven," being preſent, the men, not only of all nations, but of all ages, the vizards ſhall be as well taken off as the maſques; and the formerly traduced ſaints being welcomed with the title of "good "and faithful ſervants," ſhall ſolemnly be acquitted by the ſentence, not of a fallible or partial judge, but of an infinite and ſupreme one, "that ſearches the hearts and "reins, and cannot be deceived or bribed; and to be ſure, that the injured ſaint ſhall come off with honour enough, he ſhall then be abſolved by being crowned.

Dan. iii. 1 Cor. iv. 9. Heb. xii. 23. Matt. xxv. 21. Jer. xvii. 10.

THIS celeſtial crown comprehending, in the ſcripture dialect, both the remaining parts of the Chriſtians reward, honour, and dignity, or glory, and preferment; it will be pertinent to mention ſome advantages, that give it an high preference above the crowns of monarchs here below.

AND firſt, earthly crowns may ſometimes be the fruits and recompences of worth and virtue, but are not at all the proofs of them. They are uſually the gifts of nature, and not unfrequently of fortune; and hiſtory gives us cauſe to wiſh, they were more ſeldom the acquiſts of crimes. But the celeſtial crowns proclaim, though not the merit, the worth of them that receive them, being never adjudged but to ſuch, whom previous graces and virtues have fitted and qualified for "the "inheritance of the ſaints in light." Col. i. 12.

BESIDES, as an earthly crown may be acquired without merit, ſo it may be poſſeſſed without happineſs. And if crimes be made ſteps to a throne, they prove ſo many thorns to him that ſits on it, who is there a more illuſtrious, not a leſs tormented malefactor; the ſublimity of a throne, as little as the height of a ſcaffold, keeping a criminal perſon from feeling the puniſhments inflicted on him there. As may appear by the inſtance of *Herod Agrippa*, whoſe throne, and gliſtering habit, which *Joſephus* takes notice of, though they procured him not only the acclamations, but adorations of the dazzled multitude, could not protect him from the incenſed juſtice of an higher king than he; ſo that whilſt others treated him as a god, he found himſelf one of the moſt miſerable of men, and was fain to haſten from a ſeat, which occaſioned, but could not protect his impiety. But a celeſtial crown, as it is graciouſly beſtowed for the ſupreme recompence of virtue, and on that account may be called a crown of righteouſneſs; ſo it always proves a bleſſing, as inſeparable from happineſs, as a thing is from itſelf. The crowns of this world, by the very advantage of being hereditary, ſhew, that they cannot preſerve the poſſeſſors from death. But the crown I ſpeak of, is by the divine beſtower of it, called "a crown "of life;" and of it, in reſpect of other crowns, may be truly ſaid, what *Solomon* ſaid of wiſdom, in reference to other goods, that "the excellency of it is, that it gives life to "the owner thereof." And though earthly crowns be ſuch tranſitory things, that we may obſerve, that even the four great monarchies of the world were by God repreſented to *Nebuchadnezzar*, but as parts of a dream, whereas the kingdom promiſed to Chriſtians, is called in the ſcripture "a kingdom that "cannot be moved," as the believers crown is, in oppoſition to thoſe fading crowns of laurel, that adorn the heads of the Roman conquerors, called an "unwithering crown of glory:" as if the laurel placed on the Chriſtian's head, could grow and flouriſh in the wreath, better than it did on the tree. Acts xii. 21. Rev. ii. 10. Eccl. vii. 12. Dan. ii. Heb. xii. 28. 1 Pet. v. 4.

BUT all that I have yet ſaid is inferior to this laſt prerogative of the celeſtial crown, that it does not only confer a relative dignity or pre-eminence, but an eſſential worth and excellency; as if the diamonds, which adorned that crown, ſhould impart their own ſparklingneſs, tranſparency, and incorruptibility, to the perſon that wears it. The higheſt preferments here below do raiſe a man above others, without raiſing him above himſelf. By being at the top of a ladder, a man comes

to an higher ſtation, but is not really taller than he was; and a vane, by being placed on the top of the higheſt ſteeple, is not from iron turned into gold or ſilver, but remains ſtill of the ſame baſe metal it was, and is but a weather-cock, and ſo the ſport of the winds. But a celeſtial crown is always attended with a perſonal improvement, befitting ſo high a dignity. The heavenly coronation has a virtue like that of the unction of *Saul*, who, upon his being made king, was enabled to propheſy, and was turned into another man. And the reſemblance holds in this too, that Chriſt is ſaid to have made his redeemed ones, not only "kings, but prieſts to God "and his Father," as if the kingly dignity were not enough, unleſs the ſacred character of a prieſtly office were added. Congruouſly to which, St. *Peter* calls Chriſtians, in general, a "royal prieſthood;" the underſtanding, the will, the affections, are all refined and elevated; and the very body itſelf is transformed into a ſpiritual body. As if the glorified ſoul did ſhine, with an undiminiſhed ſplendor, through its happily changed manſion. And we may well ſuppoſe, that this will be a bright and noble ſtructure, if we remember, that the angels, who, in their appariti-ons to good men, were wont to be very careful not to frighten them, did yet appear with a majeſtick ſplendor; and that angel, that the apoſtles ſaw in our Saviour's ſepulchre, is repreſented, as a young man clothed "in a long "white and ſhining garment." And we are told by St. *Paul*, that, in the future ſtate, "our vile bodies ſhall be transformed into "the likeneſs of his glorious body;" and how glorious it is in heaven, we may gueſs, by what it was at his transfiguration here on earth, during which, the ſcripture relates, "that his face did ſhine as the ſun, and his "raiment was white as the light." And of *Moſes* and *Elias*, though they came to ſpeak to him of his death, it is added by St. *Luke*, "that they alſo appeared in glory." And ſince our Saviour has aſſured us, that "thoſe "that ſhall be accounted worthy of that ſtate," ſhall be like, or equal to the angels; and that then the "righteous ſhall ſhine like the ſun "in the kingdom of their Father," who knows but, that the transfigured ſoul and body of ſome happy ſaint may be as glorious a ſight, as that which appeared to St. *John* in the Apocalypſe, when he ſaw an angel "ſtanding in "the ſun?" If it be ſaid, that theſe are very bold hyperboles, I hope the texts, I have mentioned, will keep them from ſeeming altogether groundleſs conceits. And when, among other excellent prerogatives, that our Saviour promiſes the perſevering believers, one is, "that he will give them power over "the nations, and to rule them with a rod of "iron;" and the other, which may well be the laſt, is expreſſed in theſe words. "To "him that overcometh, will I grant to ſit "with me in my throne, even as I overcame, "and am ſet down with my Father in his "throne." And though I readily yield, that theſe expreſſions are not to be ſtrictly and literally taken; yet, when I conſider the infinite power, and goodneſs of God; and that, for ought we know, he may have numberleſs dominions, and ſets of governable creatures, that we are yet ſtrangers to; I think, God's attributes, and Chriſt's expreſſions, may warrant us to expect amazing things from him, that is able, and has declared himſelf willing, to do for us "above what we can aſk, or," in our preſent ſtate, ſo much as "think." And, at leaſt, that will be allowed me, which I drive at in this celebration of our future happineſs, that the Chriſtian religion, by propoſing ſuch ineſtimable rewards, preſents believers with far higher motives to heroick virtue, than morality, or philoſophy, can afford other men.

1 Sam. x.
Rev. i. 6.
1 Pet. ii. 9.
Mark xvi. 3.
Luk. xxiv. 4.
Phil. iii. 21.
Matt. xvii. 2.
Luke ix. 31.
Matt. xxii. 30.
Matt. xiii. 43.
Rev. xix. 17.
Rev. ii. 26, 27.
Rev. iii. 21.
Eph. iii. 20.

ADVERTISEMENT.

THE author being deſired to add yet ſomething to the foregoing diſcourſes, to give the book they make parts of, a thickneſs more proportionate to its largeneſs; he did, among other papers of his, that he turned over, in compliance with that requeſt, light upon an epiſtolary diſcourſe, which by its very being unfiniſhed ſeemed (by reaſon of its ſhortneſs) the more fit to ſerve the preſent turn. For this tract having been drawn up in a country, whence the author was obliged to remove, before he had made any conſiderable progreſs in his work; he was eaſily induced to put it up in a bundle of other writings, which, like this, were laid aſide, till he ſhould be at much leiſure to complete them. But, upon the newly mentioned occaſion, finding, that among divers looſe and leſſer memoirs, that had been thrown together in order to the deſigned treatiſe, there were fifteen or twenty pages at the beginning that were coherent enough; he was content they ſhould attend the Chriſtian virtuoſo, becauſe of the affinity of the things deſigned in both the papers; which being to recommend the Chriſtian religion to worthy ſouls, it was congruous enough, that a diſcourſe, which ſhews, that the Chriſtian religion may very well conſiſt with a philoſophick genius, ſhould be accompanied by another, that tends to manifeſt, that greatneſs of mind, which compriſes uncommon degrees of virtue, is not only conſiſtent with Chriſtianity, but may be highly promoted by it. Thoſe, that reflect on this aim, will not (it is hoped) think it ſtrange, that the ſtile is a little raiſed; ſince though the ſubject be theological, yet the writer (who was then many years younger than he now is) being a perſon of honour, and writing for a noble gentleman, who, like himſelf, was a layman; it was thought not only allowable, but fit, that the ſtile ſhould not be altogether unſuitable to the ſubject and to the aim; which was to make impreſſions on an illuſtrious perſon, not by dry precepts, or languid diſcourſes, but by exciting him to heroick virtue, by the nobleſt patterns and ideas, and the moſt moving incentives, he could propoſe.

AND

And though the diſcouragements lately mentioned, and ſince encreaſed by the author's not being able to find ſome of the principal materials he had, in looſe ſheets, provided for the following diſcourſe, oblige him to lay aſide the thoughts of compleating it; yet becauſe it is very poſſible, that ſome elevated ſoul may have a mind to proſecute the deſign, or cultivate ſo noble a ſubject; he thought it not amiſs (as little ſamples of his method or way of treating it) to ſubjoin to the greater fragment, beſides the index of the heads of diſcourſe, intended for the firſt part, five or ſix leſſer fragments, that he lighted on, whilſt he was ſeeking for ſome papers belonging to the ſame tract, that ſhould have been, but were not found in their company.

CHAP. III.

First fragment.

To have high aims and noble deſigns, is ſo genuine a mark, and effect of greatneſs of mind, that there is not any more generally acknowledged; inſomuch that ambition, though it be but a depravation or a counterfeit of this heroick frame of mind, does yet ſo dazzle the eyes of the greater part of men, as to paſs for magnanimity; and noble attempts do oftentimes, even when they fail of ſucceſs, not miſs of eſteem.

——*Magnis tamen excidit auſis,*

was meant for an encomium by him, that ſaid it. And I remember, that one of the ancients reckons it among the glories of that great captain *Hannibal*, who long ſucceſsfully diſputed with the Romans the empire of the world, that he reſolved to beſiege *Rome*, though he never proved able to lead his army within the ſight of her walls.

Now as to have elevated aims is one of the chief ſigns, and indeed parts of an heroick temper of mind; ſo there are no men, that ſeem to me to have nobler and ſublimer aims, than thoſe, to which a true Chriſtian is encouraged; ſince he aſpires to no leſs things than to pleaſe and glorify God, to promote the good of mankind, to improve, as far as poſſible, his perſonal excellencies in this life, and to ſecure to himſelf for ever a glorious and happy condition in the next.

CHAP. IV.

Second fragment.

One of the grand difficulties, that he, who would be highly virtuous, muſt expect to ſurmount and conquer, eſpecially in ſuch a degenerate age as ours, is the temptation, that is afforded by the univerſality of vicious cuſtoms and examples. I wiſh it were needleſs ſolicitouſly to prove, either how great an influence examples, eſpecially bad ones, have on the generality of men; or how general bad examples have been in moſt ages, and in particular in that we live in. The ſcandal given by bad examples, though it be one of the moſt obvious temptations, is none of the leaſt dangerous. For intereſt, baſhfulneſs, and that very complaiſance and civility, that is ſo uſually found in well-bred or good-natured perſons, makes them very unwilling to offend or diſoblige the company they live with, and whom they have ſeveral inducements rather to pleaſe and gratify by imitation and compliance, than tacitly to reproach by non-conformity to their ſentiments, and practices. And in effect we find, that many, that could not be perverted by the frowns and threats of the vicious, have been debauched by their company and example. Againſt this powerful temptation religion ſtrongly arms its hero, both by precepts and precedents. "Thou ſhalt not follow a multi-"tude to do evil," was the expreſs command of the Moſaic law. "Say not thou a confe-"deracy to all to whom this people ſhall ſay "a confederacy," was the command of God to his prophet. Our Saviour makes it an argument to diſſuade his diſciples from an anxious ſolicitude about meat and drink, and clothing, that after all theſe things the Gentiles (which are by far the moſt numerous part of mankind) do ſeek. And upon the ſame ground, he endeavours in the ſame divine ſermon upon the mount, to keep them from vain repetitions in prayer. And whereas it may ſeem an immodeſty to dare to diſſent from others, that vaſtly ſurpaſs us in number; the heroick conqueror of *Canaan* ſpeaks thus to the whole body of the victorious Jewiſh nation, that they may chooſe to ſerve whom they thought fit, and worſhip either the gods, whom their fathers ſerved, or thoſe worſhipped by the neighbouring nations; but as "for me and my houſe, we will ſerve the "Lord." "Be you not conformed to this "world," ſays St. *Paul*. And another apoſtle, ſpeaking of himſelf and the true Chriſtians of his time, ſcruples not to affirm it paſſionately and roundly, "we know, that we "are of God, and the whole world lies in "wickedneſs." 1 John, v. 9.

Nor does religion furniſh us with precepts only to diſobey cuſtom and example, but with precedents too, of which there are three ſo illuſtrious, that I know not how to paſs them by. The firſt is afforded by *Lot*, who lived in a place, that was grown ſo proverbial for the height of wickedneſs, that to aggravate their ſins by the moſt hyperbolical compariſon, we muſt liken them to themſelves; and they were grown ſo wicked, that in a place, where an admirable plenty, and an unbounded libertiniſm could not but make them very populous, there could not be found half a ſcore of good men, the generality of that curſed people being fallen ſo much, not only from virtue, but from common honeſty, that they did not reſtrain themſelves ſo much as to human vices. And yet, even the ſins of *Sodom*, which cried ſo loud as to reach heaven, and bring down fire and brimſtone from thence, diſturbed *Lot*'s quiet, without deſtroying his innocence; and an apoſtle aſſures us, that that "juſt man was but vexed with "the filthy converſation of the wicked," not prevailed with in the leaſt to imitate it.

The

THE next inſtance of a religious courage, inflexible to bad examples, is afforded us by the three friends of *Daniel*, who, at the great ſolemnity of the dedication of *Nebuchadnezzar*'s golden image; when they had, beſides that great and ſtern monarch's command, the example, not only of many men, but many nations, and a more numerous aſſembly of perſons, conſiderable for quality and dignity, than the world ever ſaw before or ſince, ſingly oppoſed their naked conſtancy to the haughty tyrant's menaces, and the proſtrate world's example. And yet theſe men were courtiers, bred among that ſupple ſort of fine creatures, that were as accuſtomed to bow their conſciences, as their knees to their proud maſter. They had not only lives to loſe, but the chief dignities of the province of *Babylon*, then the queen of nations. And they could not upon their refuſal quit the ſtatelieſt palace in the world, without immediately changing it for a burning fiery furnace.

THE laſt inſtance I ſhall name, and the moſt illuſtrious that can be named, is that I am ſupplied with by *Noah*: he lived in an age, in which there were as many heinous ſinners almoſt as there were men: though vice has generally had a *Benjamin*'s portion in the diſtribution of mankind betwixt it and virtue, yet *Methuſala* excepted, the inequality was grown ſuch, as gave vice rather a monopoly than a ſhare of men; or if a diſtribution were to be admitted, it was ſuch a one as that made of *Saul* and his army, when all the people were on one ſide, and only he and *Jonathan* on the other. It is ſtrange, that when the world was ſo recent, that many that were then alive might remember and converſe with one, that for two hundred years lived contemporary with *Adam*, (for ſo we may gather *Methuſala* to have done) men ſhould ſo ſoon forget all ſentiments of piety. But yet in *Noah*'s time the world could not be compared to its preſent ſtate, where though it be night in one place, it is day in another; but to the ſtate of *Tohu va Bohu*, or the firſt chaos, where darkneſs was over the face of the univerſal deep. For the ſcripture tells us, Gen. vi. 12. "that all fleſh had corrupted his way upon "the earth, that every imagination of the "thoughts of man's heart was only evil con"tinually." And though *Noah*'s family were ſaved with him in the ark, yet it may be doubted, whether that were a certain token of their being untouched by the general contagion. For that wonderful veſſel contained beaſts clean and unclean, harmleſs and rapacious, and in it were ſaved wolves as well as lambs, and vultures as well as doves. And where God gives the reaſon, why he vouchſafed to receive *Noah* and his houſe into the ark, he expreſſes it thus; "for thee have I "ſeen righteous before me in this generation," without making mention of any of his family. Nor was the wickedneſs of the antediluvian world more univerſal than it was great; that mungrel breed were guilty of ſins as gigantick as themſelves. The text ſays, "that the earth was filled with violence" through them; and thoſe impious rebels againſt their maker broke the laws of nature with an inſolence, that provoked him to break off the courſe of nature to puniſh them, ſince nothing leſs than an univerſal deluge of water could place limits to ſuch an impetuous and overflowing impiety. But all theſe ſinful examples, how general ſoever, could not prevail on *Noah* ſo much as to keep him from giving one of a quite contray nature: the ſcripture calls him an herald or "preacher "of righteouſneſs;" and though it appears 2 Peter ii. 5. not, that he made any converts, he perſevered in his rejected admonitions for ſix ſcore years, a time long enough to have tired his patience, eſpecially ſince he did not any of his hearers obſtinacy. And his conſtancy raiſed him as much above the reach of their temptations, as the waters that puniſhed their ſin raiſed his ark above their drowned manſions. And now go and compare with any conſtancy of the following times, where virtue has always had ſome party, though not a numerous one, this unequalled ſingularity of *Noah*, which God himſelf ſeems to have taken ſpecial notice of, not only by that patriarch's wonderful preſervation, but by ſaying emphatically, "thee have I ſeen righteous be- Gen. 7. i. "fore me in this generation," which was ſo brutiſh and depraved, that I know not, whether he were not obliged to live among worſe brutes before he finiſhed the ark than afterwards, when in it he was ſhut up with lions, foxes, and tygers.

ANOTHER virtue, that belongs to a great mind, is conſtancy, or perſevering patience in afflictions. This quality hath ſo noble an appearance, that when it is exerciſed even by malefactors, it obtains our eſteem; and whilſt we cannot ſo much as excuſe their actions, we cannot but commend the manner of their ſuffering for them: calmneſs of mind, in the midſt of outward ſtorms, being ſomething, that looks ſo handſomly, that crimes and gibbets cannot keep it from doing ſo; nor hinder thoſe, in whom it is found, from being both pitied and applauded. Third fragment.

THAT this part of greatneſs of mind is befriended by the Chriſtian religion, more than by any other inſtitution, will appear; if we conſider, what it contributes to conſtancy and patience, under outward preſſures and calamities, by precept, by examples, and by arguments.

CHAP. V.

HUmility is a virtue, that, at the firſt bluſh, ſeems ſo diſtant from greatneſs of mind, that ſome would think it improper to refer the former to the latter, under any other notion, than that of an oppoſite. But, whatever may be thought of humility, ſolitarily conſidered, yet, when we find it in conjunction with thoſe other qualities, that contribute to make up greatneſs of mind, it adds to their number; and though it does not perhaps ſhine as bright as ſome of them, is as amiable as any; and imparts ſomewhat of its Fourth fragment.

own lovelineſs to all the reſt. And you will not much wonder, that I place this virtue among thoſe that conſtellate, if I may ſo ſpeak, an heroick mind, if you conſider, whence humility may in ſuch a ſoul proceed, and what difficulties it may ſurmount. For if wealth, honour, and other outward bleſſings exalt our hero's condition; to be humble, in the midſt of ſuch advantages, argues a mind elevated above the preſents of fortune, and ſpeaks a ſoul great enough to undervalue thoſe things, that ordinary ſouls admire; and which even men, that paſs for great, make the objects of their ambition, and, when attained, of their pride. And if our hero be ennobled with great virtues, or famous for great actions; his humility argues, that he has ſo raiſed an idea of virtue, and dares aſpire to ſuch a pitch of it, that he cannot reſt ſatisfied with greater attainments, than perſons, but ordinarily virtuous, aim at; and looks upon himſelf as obliged and born to an unwearied purſuit of heroick and ſtill increaſing degrees of excellency. And if a laudable practice, by being extremely difficult, is a mark of a great ſoul, humility muſt not be denied that character; for this is a virtue more difficult to excellent, than to ordinary, ſouls. In other caſes, a hero is to contend but with his vices, or his paſſions, or his open enemies; but to be humble, he muſt overcome his virtues too; and that, when they act unitedly as one body: ſince, though other virtues naturally aſſiſt one another, they all conſpire to ruin humility; which, having pride to contend with, is to deal with ſo ſubtle an adverſary, that ſometimes even by being foiled he overcomes. And as the torpedo poiſons his arm, that wounds it; ſo ſometimes in the beſt arguments we employ againſt pride, the very ſtrength and ſeeming ſucceſs of them tempts the maker of them to be proud; and I will not ſwear, that, at this very time, I exalt our hero's humility, without any diminution of my own.

To the attainment of an eminent degree of this lovely both virtue and grace the goſpel conduces, by furniſhing its embracers with expreſs injunctions, clear directions, high rewards, and other weighty motives, and the nobleſt patterns and perfecteſt examples, that ever were or can be given.

The Heads of the Diſcourſe, entituled, *Greatneſs of Mind, befriended by Chriſtianity.*

The INTRODUCTION.

1. OF the true notion of greatneſs of mind. Fifth fragment.

2. OF the Tendency, that the Chriſtian religion has to promote greatneſs of mind in general.

3. THAT Chriſtianity gives men noble aims, ſuch as the glory of God, the pleaſing of him, the general good of men, perſonal excellencies in this world, and eternal happineſs in the next.

THE virtues or qualifications, which, as ſo many conſtituent parts, make up greatneſs of mind, and are peculiarly befriended by Chriſtianity, are chiefly theſe,

4. COURAGE or valour.
5. CONSTANCY and patience in afflictions.
6. BOUNTY or liberality.
7. FORWARDNESS to oblige.
8. READINESS to forgive.
9. A JUST and impartial eſtimate of riches, and other things, that ordinary men covet and admire.
10. HUMILITY.
11. A CONTEMPT of all that is baſe.

The end of the FIRST PART.

GREATNESS of MIND

PROMOTED BY

CHRISTIANITY.

The SECOND PART.

Sixth fragment.

THE former diſcourſe has, I hope, ſufficiently manifeſted, that, of the ſeveral virtues and noble qualities, that make up true greatneſs of mind, there is not any, that is not at leaſt conſiſtent with Chriſtianity, and that moſt of them are eminently promoted by it. But I expect your φιλήδονος will pretend, that there are ſome qualities required by our religion, that directly and powerfully tend to debaſe the mind they poſſeſs; and hinder it from attaining, or even aſpiring, to ſuch great things, as it would reach to, if it were not detained or depreſſed by religion. Let us now therefore examine, whether, notwithſtanding the wings, which we have ſhewn that religion adds to the mind, the clogs, that it faſtens to her, be heavy enough to diſable her to raiſe herſelf above the pitch of vulgar ſouls; and force her, inſtead of ſoaring aloft, to flutter about the earth.

THE chief things, that, as far as I can learn, are alledged, either by *Philédonus*, or more conſidering adverſaries than he, to ſhew religion to be either quite inconſiſtent with, or very unfriendly to, greatneſs of mind, are theſe. —

[But, in regard, that I find not the anſwers, that were drawn up to the objections; and it is not ſo convenient to let the latter appear unaccompanied by the former, it is thought the ſafeſt way to leave them both at preſent unmentioned; and only take notice, that to the laſt of the ſix objections, which, to deal candidly, were named and conſidered, theſe words were found ſubjoined.]

AND now, if it appear, that neither any nor all of theſe have ſuch an unfriendly aſpect on greatneſs of mind, as is pretended; and that at leaſt the impediments, they can bring, are much more than countervailed by the aſſiſtances, that religion affords heroick virtue; I hope it will appear, that greatneſs of mind is not incompatible with Chriſtianity, but rather promoted by it.

Experimenta

Experimenta & obſervationes Phyſicæ:

Wherein are briefly treated of

SEVERAL SUBJECTS

RELATING TO

NATURAL PHILOSOPHY

IN AN

EXPERIMENTAL WAY.

To which is added,

A ſmall Collection of ſtrange REPORTS.

A LETTER that may ſerve for a Preamble.

To my learned Friend Mr. *H. Oldenburg*, Secretary to the Royal Society.

SIR,

BEING at length come to a reſolution, I have already done ſomething more than barely entred upon that way of writing, that you and I have more than once diſcourſed of together; and wherein you particularly (though not you only) among my learned friends have wiſhed to ſee me engaged.

IT is not, that I am inſenſible of the prejudice, which the things I deliver are like to ſuſtain, by the diſadvantageous dreſs, wherein they muſt appear, in the way of writing I have pitched upon; which being for the moſt part plainly hiſtorical, and ſet down in the order wherein they chanced to come to hand, denies moſt of them, not only the uſual ornaments of other books, but the allowable advantages, that method, elaborate diſcourſes, neat hypotheſes, and ſubtile diſputes, are permitted to bring even to philoſophical writings.

BUT theſe conſiderations were overſwayed by a ſad one, founded upon the (yet continuing) condition I was in, when I was debating this matter in my thoughts. For it having pleaſed God (to whoſe always moſt juſt diſpenſations men ought entirely to ſubmit) to afflict me with the ſtone and the palſy; as on one ſide, theſe added to a ſufficient number of *avocations ſcarce permit me any great expectation of finiſhing in a ſhort time the tracts I had made a leſſer or greater progreſs in, according to my firſt deſign; ſo on the other ſide, my friends judging it unfit, that the materials provided for theſe more than begun treatiſes ſhould be quite loſt, or kept too long uſeleſs, it ſeemed expedient, that as opportunity ſhould from time to time ſerve, I ſhould look over my memorials, and other ſcattered papers, to take notice, what experiments and obſervations were to be found in them.

UPON theſe and the like inducements, having picked up ſeveral of my diſperſed papers, ſome of them written many years ago, and ſome of a leſs ancient date, I began to refer the moſt part of what I found hiſtorical in them, together with ſome few things, that did ſeem neceſſary not to be ſevered from them, to certain heads or titles, which I called chapters; and made them the more numerous, that they might ſingly be the leſs prolix: and about theſe I muſt deſire your leave to repreſent ſome things by way of preface.

AND firſt, ſeveral of the enſuing particulars, that I met with among my papers, being parts of eſſays, or other diſcourſes, and being for haſte tranſcribed for the moſt part verbatim, as they were couched there; I dare hope for your excuſe, if among ſuch tranſcripts you now and then meet with things, which, how pertinent ſoever to the tracts they

firſt belonged to, might have been ſpared as needleſs, if not ſometimes foreign alſo, in the new form the diſcourſes are now put into; ſince I could not leave out ſuch unneceſſary clauſes (whereof yet I hope you will not find many) without too much mutilating the coherence, or obſcuring the ſenſe of what is delivered; and I could not alter them, and adapt others to ſupply their places, without ſpending more time, and taking more pains, than in the condition I am now in, I ſuppoſe you would be willing to condemn me to.

NEXT I deſpair not, but you will allow me the liberty I have taken, to vary the bulk and method of particular chapters, as my occaſions would permit, or the plenty or paucity of materials ſuggeſted, or the nature of the thing I treated of, and the ſcope I propoſed to myſelf in writing of it, ſeemed to require. But ſometimes my want of health and leiſure, and my deſire to haſten to other ſubjects, that either pleaſed me better, or ſeemed more conſiderable, made ſome of the following chapters, compared with others, but ſhort; eſpecially if I were ſupplied but with a number of things pertinent to that ſubject, by the papers I had then in hand, how much ſoever I may have written of it in other papers, which I hope hereafter to be maſter of.

AND this advertiſement may render you a reaſon, why to the title of ſome of the chapters I have ſubjoined the firſt ſection, though it be not at preſent followed with a ſecond.

AND as for my having employed very differing methods in ſome of the enſuing tracts, I did it with deſign, as judging ſuch a variety of methods more conducive to my purpoſe, than uniformity in it would have been. For beſides that ſome of the treatiſes, whence theſe chapters were taken, did by the ways, wherein they were already written, oblige me to accommodate myſelf to their method; I thought, that if you ſhould ſhew theſe papers to any, that are very unacquainted (which I have heard you complain, that too many are) with the way of accommodating, in ſome tolerable manner, his enquiries and his writings to the ſeveral ſubjects he applies himſelf to, he may be ſomewhat helped by the differing examples he may here meet with, to make variations ſomewhat ſuitable to the differing natures of the ſubjects he deals with.

BUT here I muſt beg you to take notice, that though in compliance with this deſign, as well as for ſome other reaſons, I have in ſeveral of the following chapters given intimations and hints of things, which I do not there proſecute; and now and then propoſe ſome conjectures and opinions, whoſe proof I do not inſiſt on; yet I am not willing you ſhould think, that however ſome of thoſe paſſages may be but occaſional things, mentioned principally to excite, and give hints to the inquiſitive and ſagacious; yet all, or moſt of them, are of the ſame kind; and that I thought not on them, but as ſlightly and tranſiently as I mentioned them; and have no better and other reaſons to alledge for my ſuſpicions or intimations, or even for my conjectures or my opinions, than thoſe you will meet with in papers haſtily drawn up; eſpecially ſince, I think, I can ſhew you divers of the things delivered in thoſe paſſages, enlarged and rendered at leaſt probable or practicable in other diſcourſes, that for certain reaſons do not accompany theſe I now ſend you.

I EXPECT, that you ſhould think it ſomewhat ſtrange, to find many of the following experiments ſet down much leſs circumſtantially, than thoſe that are mentioned in the phyſico-mechanical experiments touching the air; in the Continuation of them; in the hiſtory of cold, and in ſome other books of mine, that you have been pleaſed to peruſe. But on this occaſion give me leave to repreſent to you, that the nature of divers of the former experiments, eſpecially chemical ones, and my aims in mentioning them, being conſidered, it ſeemed not requiſite they ſhould be more fully treated of: and as for others, though the brevity and diſpatch, which divers reaſons made me propoſe to myſelf, had not forbidden me to amplify; yet I daily feel my leiſure, not to ſay my life too, ſo torn piece-meal from me by ſickneſs, viſits, buſineſs, and inevitable avocations, that I am frequently admoniſhed to haſten the ſecuring of as much as conveniently I can, by diſpatching particular ſubjects, and am quite hindred from dwelling ſo long upon them, as if I had more health and leiſure, I ſhould willingly do. To theſe things perhaps ſo favourable a perſon as Mr. *Oldenburg* will add, that the characters, which learned writers, Engliſh and foreign, though divers of them perſonally unknown to me, have been pleaſed to give of the diligence and ſincerity employed in ſetting down the *phyſico-mechanical experiments*, and thoſe of ſome other writings of mine, may permit me to hope, that it will be thought, that after having been divers years verſed in making trials and experiments, I have made them with ſome care and warineſs, and mentioned them faithfully, where I have not done it amply, upon hopes it may be taken in good part from a perſon in my preſent condition, that was never a profeſſor of philoſophy, nor ſo much as a gown-man; to have made ſhift to make the experiments and obſervations he communicates, and ſet them down truly and candidly, without fraudulently concealing any part of them, for fear they ſhould make againſt him. And though perhaps you will eaſily believe, that in divers of the experiments which I have but briefly mentioned, I have been as diligent an obſerver of circumſtances, as I was wont to be when I made thoſe, which have had the luck to be taken notice of for being fully related; and though it may be alſo, that ſome ſcruples or objections, which my brevity may in part occaſion, were not unforeſeen by me, and might have been avoided by a more copious and diffuſed way writing; yet I purpoſely decline ſuch a way of delivering things, not only for the reaſons

above mentioned; and becauſe I ſuppoſe them, that may peruſe theſe papers, to be acquainted with my formerly publiſhed writings, and to have either from them, or otherwiſe, underſtood the way of making ſuch experiments as mine; but alſo, becauſe, though I wanted time and health much leſs than I do, I ſhould not think it fit too much to prevent the induſtry of others about the trials I mention; and reap the field ſo clean, as not to leave them, not only ſtore of ears to glean, but ſome corners of ſtanding corn; I have therefore here and there purpoſely omitted both, ſome not abſolutely neceſſary practical directions about making of trials, that might prevent ſuch ſcruples or objections, as have the grounds of anſwering them clearly delivered in my printed books; and ſeveral, not only leſſer circumſtances, but conſiderable phænomena, and obvious applications, that may probably occur to others, as they did to me in making the trials, and reflecting on them.

Advertiſements about the diſpoſition of the following treatiſe.

YOU will quickly diſcern, that the following chapters could not be intended for compleat tracts about the ſubjects handled in them. And indeed they were intended but for ſuch memoirs about the various particular ſubjects they treat of, as may be ſerviceable to the ſolid natural hiſtory, that has been nobly deſigned, and is ſtill proſecuted by the Royal Society. Wherefore ſince (at leaſt in our age) no writer, that I know of, has ſo early and ſo well, both urged the neceſſity of natural hiſtory, and promoted divers parts of it by precepts and ſpecimens, as the illuſtrious lord *Verulam*; I ſhall not ſcruple in the way or manner of writing theſe ſhort collections of mine, to make uſe ſomewhat frequently of his authority and examples, but without confining myſelf to either.

I. AGREEABLY to this advertiſement you will find, that ſome of the particulars, that the following treatiſe conſiſts of, are ſingle, and as it were, independent ones; upon which account they reſemble thoſe, which in the *Verulamian Sylva*, or Natural Hiſtory, are called experiments ſolitary: and have for that reaſon induced me to give that title to each of the ſeveral chapters, that are made up of them.

II. ANOTHER ſort of chapters there is, wherein divers experiments and obſervations, all of them relating to the ſame ſubject or purpoſe, are ſet down together. Theſe, if they were ranged and ſorted in order to diſtinct theories, I ſhall call, in imitation of the mentioned author, experiments in conſort. But my backwardneſs to frame theories has made me chuſe to forbear as yet to methodize them; and therefore has made me think fit to call them only various experiments and obſervations about this or that ſubject, which they belong to.

III. MY haſte, though not that only, induced me to make one ſort of chapters more, that partly agrees with, and partly differs from each of the two that I come from mentioning: for in every one of theſe chapters, there are two or three, if not more, ſingle or ſolitary experiments; and there are alſo others, that have ſome kind of connexion among themſelves, as being referrable to the ſame ſubject or purpoſe. On that ſcore the title, that is given to each of the chapters of this third ſort, is that of miſcellaneous experiments, and ſometimes (but ſeldomer) of promiſcuous ones. And all the particulars, that I refer to the three forementioned heads, are caſt into chapters, wherein the ſeveral kinds are diſtinguiſhed only by their titles, or not.

IV. THERE is one advertiſement, that regards all the ſorts of particulars, that are referred to the forementioned chapters; which is, that I have uſually comprehended obſervations, as well as trials, under the title of experiments; which I have done, not only upon the authority, and in following the example of our judicious chancellor, (as is every where obvious in his *Sylva Sylvarum*) but for other reaſons to. For both the ſorts of particulars may paſs for matters of fact, and ſo are hiſtorical, taking the word in a lax ſenſe; and the employing it in that ſenſe makes the articles or paſſages, whereof the chapters and other parts of our collection conſiſt, much more commodious for references and citations.

V. BESIDES the three forementioned kinds of chapters, you will meet, in the enſuing treatiſe, with another ſort of writings, whereof ſome are almoſt entire, and others fragments of larger diſcourſes. In neither of theſe did I confine myſelf ſo much to matters of fact, as in thoſe chapters, that conſiſt of experiments and obſervations; but took the liberty, as occaſion required, to enlarge in diſcourſes, and ſometimes to cite ſuch paſſages out of other mens writings, as I judged I could make ſome pertinent application or uſe of, perhaps unthought of by the author. And theſe papers being moſt, if not all of them written in a more free and diſcurſive way, I thought fit to ſeparate them from the ſets of collections, that are almoſt merely hiſtorical, and accordingly I have not ſtiled them chapters, but titles; and have forborn to aſſign them, as I did the others, ordinal numbers; which I deſire likewiſe you would not prefix to any of them, becauſe I am not yet reſolved how I ſhall diſpoſe of them, either by ſupplying what is wanting to finiſh any one or more of them, or by taking to pieces, and employing thoſe pieces as materials for other tracts.

VI. PERHAPS I ſhall not be thought to need pardon, if to comply with their curioſity, who affect moſt thoſe experiments, that are either uncommon, or teach them to do or perform ſomething uſeful or pretty; I ſometimes prefix a title, declaring what it treats of, to a particular experiment (or obſervation) which for its importance, novelty, or uſefulneſs (theorical or practical) may deſerve to be diſtinguiſhed; ſince by this means ſuch particulars may be better impreſſed on the me-

mory, to gratify thoſe, whoſe nicety or want of leiſure may make them well pleaſed by a tranſient view of the titles we ſpeak of, to find ſuch paſſages, as they chiefly looked for, with leſs trouble than that of peruſing an index.

VII. AMONG the experiments our collection conſiſts of, there is here and there one, to which it was thought fit to add ſomething, either by way of explication, or of illuſtration, or of confirmation, or of anſwer to objections, or of theorical reflection, or of practical application, *&c.* And theſe ſupplements or additions it was thought fit to call ſometimes annotations, but oftner ſcholiums, becauſe that term is freely uſed in a very comprehenſive ſenſe by mathematical writers. But though I readily acknowledge, that this term has been chiefly employed by mathematicians; yet the uſe of it has not been ſo confined to them, but that good authors in other parts of learning have not ſcrupled to employ it, as may appear by the ſcholiums, that ſome learned phyſicians have written upon *Hollerius*, an eminent perſon of their profeſſion; as alſo by the example of the famous and experienced *Foreſtus*, who has not ſeldom ſubjoined ſcholiums, even to his own medicinal obſervations.

VIII. THE mention of theſe ſcholia prompts me to tell you, I had almoſt forgotten, but yet muſt not leave unmentioned, that I thought fit now and then to premiſe to ſets of experiments, and ſometimes (though more ſeldom) to a ſingle obſervation, a ſhort preamble by way of introduction, which may often excuſe the need of ſubjoining a ſcholium, and may be warranted by the example of the lord *Verulam* in his centuries, wherein he often inſerts ſuch ſhort preambles, as things fitted to give light to the experiments they belong to, and to give ſome advertiſement, both of the nature and importance of the ſubject, and of the ſcope of the writer, or of other uſeful circumſtances.

IX. IF among my own experiments, namely, thoſe that I have made or ſeen, I have ſometimes inſerted experiments or obſervations that are not ſo; I have not done it without reaſon, and am authoriſed in that practice by frequent examples afforded me by the firſt, if not only author that I know of, that gave us a ſet of precepts of well writing natural hiſtory, our often cited *Verulam*, whoſe centuries do in great part conſiſt of borrowed experiments and obſervations; without which he was ſenſible, that his *Sylva* muſt be of too narrow a compaſs, or too thinly ſtocked with plants, eſpecially with trees. And indeed it is not to be expected, that as the ſilk-worm draws her whole manſion altogether out of her own bowels, ſo a ſingle man ſhould be able to write a natural hiſtory out of his own experiments and thoughts. And he, that will ſtrictly confine himſelf to thoſe, will be often reduced to omit things very pertinent, if not neceſſary to his ſubject, which is of practice ſtudiouſly declined by me, who prefer the reader's utility to the ambitioned glory of being thought to borrow nothing from any body. And I can add in my defence, at leaſt my excuſe, that I have made uſe but of a ſmall part of the liberty allowed me by the example of ſo great a guide in the way of writing natural religion. For I have very much ſeldomer than he employed the trials of others, and have yet ſeldomer mentioned unverified reports or vulgar traditions, being careful, that the bulk of the matters of fact I deliver ſhould conſiſt of things, whereof I was myſelf an actor, or an eye-witneſs; and that the comparatively few borrowed experiments, that I added, (that I might not deprive my reader of ſome things very pertinent and uſeful to my ſubject) were received from perſons of very good credit; beſides that I do not only frequently give ſufficient intimation in the experiment or obſervation its ſelf, but oftentimes by placing the letter C in the margin, do give notice; nay, and ſometimes to a whole ſet prefix the title of communicated experiments or obſervations.

X. I HAVE nothing more to give you notice of here, ſave that, whereas you will find, that I write but on one ſide of the leaves, whereof this book * conſiſts; I did ſo for two reaſons. The firſt, that in caſe I ſhould have occaſion to employ any of theſe experiments in other treatiſes, for which I am more concerned than for this rhapſody, I might have room to ſubſtitute, if it ſhould be thought fit, one or more of my later experiments in its place. And ſecondly, that I might have room, if I can get leiſure, to write annotations, or make reflections, or illuſtrations, or corrections, or, in a word, ſuch additions and alterations of particular experiments and paſſages, as they ſhall be thought fit to deſerve or need.

I AM ſenſible, that this preamble, increaſed by the advertiſements, that it was thought neceſſary to annex to it, is of a length, that may ſeem diſproportionate to the book or tract it is prefixed to. But I may in excuſe of this repreſent to you, that the bundle of writings you now receive is but a part of the book; to which, if God vouchſafe me health and leiſure, this preface enlarged by its appendix, is deſigned for an introduction. And in that caſe it is hoped, that theſe preliminaries, as many as they are, will not be thought impertinent, or needleſsly prolix.

* This refers to the manuſcript that was ſent to Mr. O. and is left to ſhew the intention of the author.

Experimenta

Experimenta & Obſervationes Phyſicæ.

TOME I.

CHAP I.

CONTAINING

Chemico-Magnetical Experiments and Obſervations.

THE loadſtone, *Pyrophilus*, is ſo admirable a body, and its uſefulneſs to mankind is already ſo great, without denying us hopes of farther improvements, that I think we muſt want curioſity or gratitude, if we neglect either to take notice of any experienced phænomena, that directly relate to ſo abſtruſe a ſubject, or by conſigning them to paper, to preſerve them from oblivion. It is chiefly by this conſideration, *Pyrophilus*, that I am induced to mention to you the following experiments and obſervations, made moſt of them by the help of the fire. For though ſome of them may ſeem but ſlight, yet they may not prove unuſeful towards diſcovering the nature of a body ſo ſtrange and ſingular, that, for ought is yet manifeſt, any true magnetical phænomena may ſomewhat conduce to the knowledge of it. And I was the rather induced to make trials and obſervations of this kind, becauſe moſt of them are ſuch, as I have not met with in authors. And the few, that remain, I have not found ſufficiently taken notice of there; philoſophers and mathematicians aiming chiefly, in their magnetical writings, to proſecute and apply the attractive and directive, and perhaps the inclinatory faculty of the loadſtone. Whereas, throwing into another paper what I obſerved of that kind, I did in the preſent enquiry mainly intend to make the loadſtone rather the object than the inſtrument of my trials; and handling chiefly the very ſubſtance of the ſtone, endeavour not ſo much to advance or apply its faculties, as to weaken and deſtroy them, though in order to the better knowing of them. Having therefore procured a conſiderable number of, for the moſt part, naked (or uncapped) loadſtones, moſt of them coarſe, but of differing ſizes, ſhapes, colours, and countries; I made upon them ſeveral trials, ſome of which I ſhould immediately proceed to give you a brief account of, but that it will be proper to premiſe this ſhort advertiſement; that I would not have the title of theſe experiments make you expect, that the fire ſhould be a main agent in every one of them; ſince to preſerve ſome few of them, I refer them hither, though an actual fire was not employed to make them; ſince the common rule, that *a potiori parte ſit denominatio*, will ſuffice to warrant, or at leaſt excuſe my giving to this ſmall collection the title of *chemico-magnetical experiments*; becauſe the greateſt part were performed by the help of the fire, or bodies chemically prepared by the application of it. And becauſe it is uſual with the beſt writers about magnetiſm, to reckon ſteel and iron among magnetical bodies; I ſhall not ſcruple to deliver in this paper ſome experiments made by the help of the fire upon thoſe ſubjects, with reference nevertheleſs to magnetiſm.

EXPERIMENT I.

HAVING ignited ſeveral loadſtones, and removed them from the fire till they grew cold again, I found a great diſparity in the viſible ſubſtance whereof they conſiſted, and the manifeſt ſtructure of the groſs parts that made them up. For ſome ſtones upon refrigeration, either fell aſunder of themſelves, or grew very brittle, when as others ſtill continued in their entireneſs: ſome of them being broken, looked not unlike iron-ore, or ſtones which I have gathered near iron-mines in *Kent*; others being broken after refrigeration appeared to conſiſt of plates or flakes of ſeveral colours, and lying parallel to one another; and others again, which as I remember were Engliſh ones, did neither appear to be compoſed of any ſuch flakes, nor had their dark colours much, if at all, changed by the operation of the fire, nor did ceaſe to be ſolid bodies.

EXPERIMENT. II.

WE could not upon the burning of ſeveral ſmall loadſtones one after another, diſcern any ſuch blue ſulphureous flame as *Porta* in his natural magick relates himſelf to have ſeen, and judges to have been, as it were, the ſoul of the loadſtone, upon whoſe receſs, he ſays, it loſt its magnetick faculty, which is moſt commonly true as to any conſiderable degree of the coitive or attractive power, but not of the directive faculty or virtue. But it may be, that *Porta* miſtook the ſmall flame, which is often emitted even by well-kindled and glowing charcoals, (on which ſort his loadſtone was placed) eſpecially when a little blown upon for the exhaling ſoul of the loadſtone; or elſe to be civil to him, we may

ſuppoſe, that his ſtone was more rich in unctuous moiſture than others are wont to be; and if we had had by us a very exact pair of ſcales, we ſhould have endeavoured to have by them diſcovered, whether the fire do deprive loadſtones of any ponderous parts.

See Exper. 10.

EXPERIMENT. III.

THE ſolidity of ſome Engliſh loadſtones made me think it fit, though I looked upon them as a kind of iron-ore, to try whether they could not be brought to ſtrike fire. And accordingly having made divers colliſions betwixt a rough piece and the ſteel of a tinder box, I found, that with much ado it was poſſible to obtain ſome ſparks, (though they ſeemed but ſmall ones:) but having taken a large piece of ſmooth loadſtone, I found, that by ſtriking it ſomewhat briſkly with the edge of a ſteeled hammer, we were able to produce good ſtore of ſparks, and ſome of them of a ſurpriſing bigneſs, for they were judged to exceed the ſize of thoſe, that are uſually afforded by common flints.

EXPERIMENT IV.

FOR certain reaſons I thought fit to make a further trial, being deſirous to ſatisfy myſelf, whether it were not poſſible to make loadſtones afford fire without the help of iron or ſteel. And being willing to comply with this curioſity, I made choice of two ſolid pieces of loadſtone, that were cut almoſt into the form of cubes; and found, that many colliſions being made between them, eſpecially at the edges, there were produced from time to time, (though not frequently) ſome ſparks of fire, though neither ſo numerous, nor ſo great or vivid, as thoſe of the foregoing experiment, wherein the ſteel was employed.

EXPERIMENT V.

I HAVE (elſewhere) formerly related, that if an oblong loadſtone made glowing hot, be refrigerated perpendicularly, the lower extreme will thereby become its northern pole. And I ſhall now add, that yet if ſuch a loadſtone be refrigerated perpendicularly, not upon an ordinary terreſtrial body, but upon the northern extreme of a much ſtronger loadſtone; in ſuch caſe, this debilitated ſtone will receive its impreſſions, as if it were an iron, and its lower extreme will not be as before, by the magnetick effluvia of the earth made its northern pole; but it will be contrariwiſe animated by the pole of the loadſtone, on which it is cooled; and, according to the laws magnetical, the lower extreme of it will not be its northern, but its ſouthern pole, nimbly attracting the north end of an excited and æquilibrated needle.

EXPERIMENT VI.

BY the forementioned way of refrigeration I alſo found, that a diſanimated loadſtone (if I may ſo ſpeak) may be reſtored to ſome degree of its attractive virtue; for I tried, that a ſmall loadſtone, which after its being made red hot in the fire, and cooled perpendicularly upon the ground, was not able to take up a fragment of a needle, being again heated, and not only cooled upon the pole of a ſtrong loadſtone, but ſuffered to reſt on it a while after, was ſoon grown vigorous enough to take up what formerly it could not move.

EXPERIMENT VII.

I FURTHER obſerved, that though a loadſtone, that had paſſed the fire, had not, by being immediately before made red hot, had its body opened, and fitted to take in plentifully the magnetical ſtreams; yet it would, like a wire of iron, acquire a new verticity from the vigorous loadſtone, but not be in many hours ſo vigorouſly impregnated with magnetick virtue, if it were applied cold to the pole of the animating loadſtone, as it would in a very ſhort time, if being glowing hot, it were refrigerated thereupon.

N. B. IT has been obſerved, that if a loadſtone be made red hot in the fire, it will ſcarce retain any ſenſible attractive virtue, ſave that it will be able, by being endowed with a magnetiſm from the earth, to drive away that pole of a needle well poiſed, which agrees in denomination with that pole of the loadſtone, which is applied to it. But I deſire, that it may be remembred, that I intimated, that this is not ſtrictly and univerſally true; for in ſome of our Engliſh loadſtones it has been obſerved, that ignition does not only leave them capable of a directive virtue, but leaves them alſo a conſiderable attractive power, ſo that they will ſuſtain a good weight of ſteel, as will appear hereafter.

EXPERIMENT VIII.

WE took three Engliſh loadſtones, that appeared to be of a very compact ſubſtance; two of them very ſmall, as not being of near half an inch in length; the other much greater, being about an inch long, and of a conſiderable breadth, but yet of ſmall thickneſs: theſe we made red hot in a fire of well-kindled charcoal, and being thoroughly ignited, removed them one after another, and haſtily ſet each of them upon a plate of ſilver, (for neither wood nor iron would have been convenient) and applying the loadſtone (capped) to each of them, whilſt it was yet red hot; it ſeemed manifeſt enough, not only, that whilſt it was in that ſtate, the ſtone had not ſo ſtrong an operation on it, as if it were not red hot: but, which is remarkable, when it ceaſed to appear ignited, but yet was intenſely hot, (ſo that it was readily able to burn his fingers, that ſhould offer to take it up between them) the armed loadſtone had a more powerful operation on it, by way of what they call attraction and ſuſtentation, not only, as I ſaid, than it had, whilſt the ignited ſtone conſpicuouſly retained

retained the colour of fire, but) than it had after the ſame ſtone was grown cold.

EXPERIMENT IX.

THIS experiment was reiterated with the two ſmaller magnets, and the greater with the like ſucceſs: and when the magnets were grown cold, they did, notwithſtanding their having been twice ignited, diſcover ſome little magnetiſm, if applied to the end of a well-excited magnetick needle, nicely poiſed upon the point of an ordinary needle [or braſs pin] (on which its centre of gravity leaned.) And I found, that the bigger of the three forementioned loadſtones, after the firſt, if not alſo after the ſecond ignition, did not only move the magnetick needle more briſkly than one would have expected, but, (which may ſeem ſtrange) being thruſt into filings of Mars, and then taken out, it carried up with it, and ſuſtained a conſiderable number of them. Whence we may conclude, that in ſome loadſtones of a very ſolid conſtitution, ſuch as this was, the magnetical virtue is more radicated (if I may ſo ſpeak) or permanent, than in the generality of other magneticks; this ſtone being the firſt, wherein I obſerved, after I had thoroughly ignited it, any attractive virtue able to take up filings of iron.

EXPERIMENT X.

ON occaſion of theſe trials I made another, which though to ſome it may ſeem but ſlight, I thought the more worthy to be made, becauſe I remember not to have read or heard of it before: we took then the ſame loadſtone, that we employed about the laſt experiment, and having again made it red hot in the fire, ſuffered it not to cool leiſurely in the air as before, but quenched it in a baſon of cold water, intending thereby to make a double variation of the experiment, firſt, by cooling it haſtily, and as it were abruptly; and next by cooling it, not in the air, but in a fluid ſome hundreds of times more denſe or ponderous than the air. The event of the trial was, that upon the immerſion of the red hot ſtone, there fell off ſome flaky matter, as if it had been ſcales of Mars; and the ſtone, when cold, would not take up any filings of iron, as before it did many; ſo that it appeared to have loſt much of the virtue it ſo lately had, though it retained the power to move a well-poiſed needle, if it were held near to either ſide of the point of it.

EXPERIMENT XI.

A BLACK oblong loadſtone, of a homogeneous ſubſtance, and weighing near three drachms, having been in a fire of well-kindled charcoals ignited, and continued ſo for ſome minutes of an hour; being weighed again as ſoon as it was cooled, was found to have loſt about $\frac{1}{8}$ of a grain of its firſt weight, and much of the blackneſs of its colour.

THOUGH the affinity between the loadſtone and iron might make one expect, that the fire might have a like operation upon this ſtone, and that out of which iron is commonly melted, both being indeed iron-ores; yet for ſome reaſons, that I cannot now ſtay to mention, I was induced to think, that the effect of ignition upon thoſe two bodies might be very differing, as I conceive their internal and unſeen texture to be. And therefore I made the following experiment.

A LUMP of iron-ore, which looked almoſt like a white ſtone, rather than a common ore, and was about the bigneſs of two eggs, being applied in ſeveral of its parts, to an excited needle, did not appear to move it manifeſtly. But being afterwards made glowing hot, and kept ſo for a while, and then refrigerated, it did in thoſe parts, which ſeemed by their newly acquired colour to abound with metalline corpuſcles; it did, I ſay, manifeſtly attract the north end of the needle. And this was tried, both with a needle of our own touching, and by the mariner's needle of a ſun-dial, whoſe flower-de-luce the burnt ore did manifeſtly draw.

EXPERIMENT XII.

To confirm the former obſervation, and alſo what I elſewhere gave notice of, that divers bodies are of a magnetical nature, or have in them ſome parts that are ſo, which yet are not vulgarly believed to be referable to that ſort of bodies, I ſhall ſubjoin the following experiment.

A BRICK, that had not been uſed, was ſawed long-ways into two equal pieces, and each of theſe (one at one time, and another at another) was heated red hot in the fire for a pretty while, and afterwards ſuffered to cool north and ſouth: and, as I expected, it thereby acquired a magnetical verticity; and with that end, that in cooling reſpected the ſouth, did a little, though but faintly, draw the flower-de-luce (which pointed out the north) of the mariner's needle; and with the other end, did ſomewhat more vigorouſly drive the flower-de-luce away, and a little attract the other extreme of the needle.

EXPERIMENT XIII.

WE took a [black] loadſtone, and having by degrees beaten it ſmall, without ſuffering it to touch any iron or ſteel veſſel, or inſtrument, [which becauſe of the hardneſs of the ſtone, was very troubleſom to do;] we ſet aſide the groſſer grains for other uſes, and upon ſome of the finer powder we poured the ſpirit of common ſalt, which had at firſt a ſenſible operation upon it, by producing fœtid fumes, and making a kind of ebullition, as that menſtruum is wont to do upon filings of iron or ſteel. But nevertheleſs, being kept a night or two in digeſtion, it drew a high tincture; and though this was not at all like the ſolutions of Mars in ſpirit of ſalt, green, but of a yellowiſh brown, not very remote

from redneſs; yet a little of it being dropped into a freſh and ſufficiently coloured infuſion of galls, turned it preſently into an inky ſubſtance, which in ſome poſitions appeared blueiſh, as a tincture or light ſolution of Mars would have done. I ſhall only add about the ſolution of loadſtone, that having carefully made it with a good aqua regia, I obtained a ſolution, ſome of which you may yet command a ſight of, that by ſome virtuoſi, to whom I ſhewed it, was thought either a fine ſolution of gold, or little, if at all, inferior to it in kind or richneſs of colour. I choſe to employ the ſpirit of ſalt, rather than that of nitre or aqua fortis in this experiment; becauſe I found the firſt named liquor to diſſolve iron very well, if not better, though leſs furiouſly than aqua fortis itſelf; and alſo, becauſe I could by this means better judge of the tincture of its colour, having formerly found by trial, that ſpirit of ſalt makes a green ſolution of Mars, but aqua fortis or ſpirit of nitre a reddiſh one. And it was to judge of the tincture of the loadſtone, as well as for another purpoſe, that I was ſo careful to keep the ſtone from touching iron, when it was pulveriſing, leſt by the hardneſs of it, and the ſharpneſs of its angles, it ſhould grate off ſome parts of the metal, and ſo alter the ſolution; for want of which caution, I have known ſome experiments about artificial gems to miſcarry; the braſs mortar, wherein the hard ingredients were beaten, having communicated ſome particles to them, that altered the colour, which the maſs after vitrification would otherwiſe have been of.

EXPERIMENT XIV.

SOME parts of the foregoing experiment may be confirmed by that which follows.

I CAUSED a weak loadſtone to be heated red hot, to make it the more eaſy to be powdered; and having cauſed it to be beaten very fine, I digeſted good ſpirit of ſalt upon it. (I afterwards found, that ordinary ſpirit would ſerve the turn.) This in a few hours acquired a tincture not greeniſh, but almoſt like that of a troubled ſolution of gold. It ſtrongly reliſhed of iron, and a little of it being dropped into infuſion of galls, it turned it immediately into an inky liquor: part of this ſolution being gently evaporated, grew thick like an extract, but did not ſeem diſpoſed to ſhoot into cryſtals; yet another part of it did precipitate with ſalt of tartar, much like a ſolution of vitriol; and another with ſpirit of fermented urine gave a plentiful but yelloviſh red precipitate.

EXPERIMENT XV.

MEETING among my looſe notes, with one, that may ſerve both for a variation and confirmation of what has been above delivered in the experiments; it ſeemed not improper to annex a tranſcript of it.

A RED mineral, whoſe conſiſtence was between ſtony and earthy, was by me judged to be a kind of iron-ore, though having powdered ſome of it, I could not find, that a good loadſtone would attract any part of it: therefore, to ſatisfy myſelf, and to confirm D. *B.*'s obſervation about the virtue of linſeed oil, I cauſed this red powder, wetted with that liquor, to be kept about two hours ignited in a crucible, by which means it was turned blackiſh. This dark coloured powder was taken out, and ſuffered to cool, and then would readily adhere to the ſame loadſtone, almoſt as if they had been a heap of filings of iron. But the operation of the fire perhaps contributed, as much (or more) as the linſeed oil to this change. For a parcel of the red powder being kept ignited in a crucible, though without the liquor, did afterwards appear magnetical.

AFTER having ſaid thus much of the moſt uſeful of uncommon ſtones, the magnet; it will not, I preſume, be thought incongruous to ſubjoin ſome remarks about the moſt precious of them, that are known among us, *viz.* diamonds, which will be done in the next chapter.

CHAP. II.

Containing various obſervations about Diamonds.

DIAMONDS being generally eſteemed the moſt noble and precious of gems, and even of inanimate bodies here below, (for of carbuncles the very exiſtence is diſputed;) the opportunity I had of being one of the committee or directors of the Engliſh *Eaſt-India* company, (whereto the deſire of knowledge, not profit, drew me) allowed me in ſome meaſure to gratify my curioſity about them, by adding to ſome obſervations of my own the anſwers I had to the queſtions I propounded to ſome *Eaſt-India* merchants and jewellers, that had opportunity to deal much with thoſe gems. Part of what I had learned about them I committed from time to time to ſome papers, which were the main things that ſupplied me with the following particulars.

THESE gems (to add that upon the by) may the rather deſerve our curioſity, becauſe the commerce they help to maintain between the weſtern and eaſtern parts of the world is very conſiderable. For as ſmall as their bulk is, their properties and mens opinion do ſo much recommend them, that I remember one of the moſt famous and intelligent merchants of this nation, (who has been governor of more than one trading company in it) being enquired of by me about the value of the diamond trade; he anſwered me, that year, according to his well-grounded eſtimate, there came from the *Eaſt-Indies* into *Europe*, one with another, to the value of about 350000 ſterl. of which about 100000 *l.* came into *England*, which at preſent, becauſe of the prudent indulgence of the government, and of the *Eaſt-India* company, is become the mart of diamonds.

I. To

I. To prove the great hardneſs of diamonds, even in compariſon of other bodies, that are thought wonderfully hard, a famous artiſt for cutting of diamonds, in return to ſome queſtions I put him, affirmed to me, that he could not either cut or poliſh diamonds with any thing but with diamonds. And he further anſwered me, that if he ſhould employ ſo rough a way, and ſuch forcible engines to cut rubies or any other ſtones, as he does to cut diamonds, it would preſently break them in pieces: which the inſpection of his engine made very probable to me.

II. A VERY ſkilful cutter and poliſher of diamonds (Mr. *L.*) being demanded by me, whether he found, that all ſorts of diamonds were of equal hardneſs, told me, that having dealt in diamonds near twenty years in *Amſterdam*, and divers years in *England*, he perceived, that there are of later years, brought over worſe and worſe ſorts of diamonds; ſo that he judges thoſe of the old rock (as he calls them) either to be quite ſpent in the *Indies* themſelves, or at leaſt to be ſeldom or never brought over to us. And he finds ſeveral of recent diamonds ſo ſoft and brittle, in compariſon of thoſe of the old rock, that he is oftentimes afraid, or unwilling to meddle with them, leſt he ſhould ſpoil them in the cutting or poliſhing.

III. NOTWITHSTANDING the (lately mentioned) wonderful hardneſs of diamonds, there is no truth in the tradition, as generally as it is received, that repreſents diamonds as uncapable of being broken by any external force, unleſs they be ſoftened by being ſteeped in the blood of a goat. For this odd aſſertion I find to be contradicted by frequent practice of diamond cutters: and particularly having enquired of one of them, to whom abundance of thoſe gems are brought to be fitted for the jeweller and goldſmith, he aſſured me, that he makes much of his powder to poliſh diamonds with, only by beating broad diamonds (as they call them) in a ſteel or iron mortar, and that he has that way made with eaſe ſome hundreds of carrats of diamond duſt.

IV. IT is an opinion received among many, that deal in gems, that as diamonds are the hardeſt of bodies, ſo the ſame compactneſs, and their great ſolidity, gives them alſo a proportionable gravity, and makes them extremely weighty, in reference to their bulk: and I ſaw in the hands of a virtuoſo a book (that I could not procure) not long ſince put out by a French jeweller, who, as he affirms, has dealt very much in diamonds; wherein the author aſſerts the great ponderoſity of theſe ſtones, in compariſon of other bodies. But this opinion agrees very little with the following experiment, that I find, among others, that I tried about gems, regiſtered to this purpoſe.

A ROUGH diamond, ſomewhat dark within, did, in a pair of ſcales that would turn either way with the 32d part of a grain, weigh 8 grains, and eight ſixteenths. This ſtone being with care weighed in water, according to the rules of the hydroſtaticks, its weight appeared to be to that of an equal bulk of that liquor, as $2\frac{15}{16}$ to 1. So that, as far as can be judged by this trial, even a diamond weighs not full thrice as much as water.

V. A FAMOUS and experienced cutter of diamonds being aſked by me, whether he did not find ſome rough diamonds heavier than others of the ſame bigneſs, told me, that he did, eſpecially if ſome of them were cloudy or foul: inſomuch that ſhewing me a diamond, that ſeemed to be about the bigneſs of two ordinary peaſe, or leſs, he affirmed, that he ſometimes found in diamonds of that bigneſs, compared together, about a carrat (or four grains) difference in point of weight.

VI. THE ſhape or figure of diamonds is not ſo eaſy to be ſecurely determined. For thoſe, that are ſeen in rings and other jewels, having been by way of preparation cut and poliſhed, have changed their natural figures for that, which the artificer thought fit to give them. And rough diamonds themſelves (which are not obviouſly met with) do oftentimes come to our hands broken, though unwillingly, by the diggers: and thereby unfit to acquaint us with their genuine ſhape, which we may alſo miſs of being able to diſcover, on account of the accidents, that the matter they conſiſted of was ſubject to, at their formation in the mine. For to omit other proofs, having had a parcel of between 100 and 150 (if I miſremember not the number) put into my hands at one time in the Eaſt-India houſe, to gratify my curioſity, I found very few of them compleatly ſhaped; but moſt of them broken, and of very irregular figures, like thoſe of ſo much gravel taken up at adventures upon the ſea-ſhore. But ſome few I ſaw, that were pretty regularly figured, which probably were not much hindered from ſhooting freely in the wombs or cavities, wherein they were coagulated or concreted. And theſe ſeemed to conſiſt, in my opinion, of ſeveral triangular ſurfaces, that were terminated in, or compoſed divers ſolid angles. And one rough diamond I had of my own, wherein this ſhape was more conſpicuous than I remember to have ſeen in any other. Beſides having enquired of a very experienced artificer, who dealt much in fitting theſe gems for the goldſmiths uſe, whether he found rough diamonds to be of any conſtant figure, and if he did, what that figure was? he anſwered me, that he always found thoſe, that had any conſtant (or, as he meant, regular) figure, to be, in his own expreſſion, ſix cornered.

VII. DIAMONDS have in them a grain (or a determinate tendency of their fibres, or rather of the thin plates they are made up of) as well as wood, and may with eaſe enough be ſplit along the grain, though not againſt it; as I have ſeen a very large diamond, that was cut according to the grain into three pieces, whereof the middlemoſt, though large, and about the thickneſs of a ſhilling, was of an even thickneſs, and exactly flat on both ſides. I have myſelf a diamond ring, whoſe ſtone I would not have poliſhed, but cauſed it to be ſet rough as nature produced it, be-

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cauſe in that ſtate the grain is manifeſt to the naked eye, and much more to a glaſs moderately magnifying the ſeveral plates it conſiſts of, having their edges diſtinguiſhable, like thoſe of a book a little opened. A cutter of theſe gems, that has had ſtore of them to practiſe his ſkill on, anſwered me, that one good blow may ſplit even great diamonds, if it be given, as they ſpeak, with the grain; but againſt the grain, he affirmed to me, as dexterous and expert an artificer as he is, that he is not able ſo much as to cut or poliſh them.

VIII. The common colour of diamonds being generally enough known by ſight, it is not needful, as it would not be poſſible to deſcribe it by words; but the moſt uſual colour of theſe gems is not the only, of which they may ſometimes be found. A great traveller into the eaſtern parts of the world aſſured me, that he had ſeen ſome of them, that were of a pale blueiſh colour. That famous French jeweller as well as traveller, Monſieur *Tavernier*, gives an account of a fair diamond that he had of a very red colour; and that great ornament of our Engliſh court, the D. of *R.* told me, that ſhe was miſtreſs of a fair one, which, though not of a ruby, was of a red colour, but not having it at hand, ſhe could not then ſhew it me. A relation of mine, in the ſame court, uſed to wear a diamond ring; which though the ſtone was not great, he valued at a hundred pound, becauſe its colour was of ſo fine a golden yellow, that I ſhould have taken it for an excellent topaz, but that he had ſatisfied me it was a diamond, to which agreed its great hardneſs, which gave an uncommon luſtre. And I remember, that ſurveying attentively a parcel of rough diamonds newly brought from the *Eaſt-Indies*, I perceived among them, beſides ſeveral lighter variations of colour, one ſtone, that was all green, and that to ſuch a degree, that I doubted not, that if it were poliſhed and ſet, it might paſs for an excellent emerald; and I ſhould have ſuſpected this gem to have been really of that kind, but that I found it among diamonds, that belonged to merchants too ſkilful in thoſe gems to be impoſed upon; and, which was more, the ſtone being yet rough and uncut, I found it plainly to have the proper ſhape of a diamond.

IX. At the late return of the ſhips from *India*, being preſent at the delivery of the diamonds to the owners, I obſerved one belonging to a Dutch merchant, whoſe father was a cutter of diamonds, and bred him to the ſame trade. The diamond came from the king of *Cholconda*; it was ſhaped (like mine) with ſix triangular ſides, which yet were neither regularly figured nor truly flat, ſome of them being a little convex, and one of them having a manifeſt and oddly-figured [illegible] in it. But the diamond being fair and [illegible] tnick, that the merchant told [illegible] too deep for one ring, and [illegible] meant to ſplit it into two; I [illegible], and found it to amount to [illegible] grains.) I could eaſily perceive the grain of this diamond, which the merchant alſo acknowledged; who anſwered me, that he had never ſeen in diamonds any heterogeneous mixture encloſed. He further informed me, that there was brought him a large diamond from *Borneo*, that was much darker than one I ſhewed him, inſomuch that he compared it to ſoot; but when he had cut and poliſhed it, he and others were much ſurpriſed to find it a fair and clear ſtone, of very great value.

X. The conjecture I have elſewhere propoſed, that divers of the real virtues of gems may be probably derived from the metalline or mineral tinctures, or other corpuſcles, that were embodied with the matter of the gem, whilſt it was yet fluid or ſoft, and afterwards concoagulated therewith: this conjecture, I ſay, may be much countenanced by the following relation, which deſerves a place in this chapter, by reaſon of its pertinency to the ſubject of it.

I have long ſuſpected, that the matter, whereof diamonds mainly conſiſt was, whilſt it was yet *in ſolutis principiis*, impregnated with metalline, and more particularly with martial ones: but by reaſon of the dearneſs of thoſe gems, and ſome other impediments, though I have been maſter of differing ſizes, cut, and uncut, yet I could never make a trial capable of ſatisfying my curioſity, till having lately met with, among other curioſities that lay long neglected by me, ſome number of ſmall diamonds, that I had bought for experiments; I conſidered, that their being yet rough, and ſo in their natural ſtate, might make them more fit for my purpoſe, and ſo it might, that they were not ſo clear as thoſe, that we value in rings, which probably argued their having more of martial tincture in them than I ſhould expect in the more diaphanous: upon this account, I ſay, I took a moderately vigorous loadſtone, (for it was none of the ſtrongeſt I have had) and applied it ſucceſſively to five or ſix of theſe ſmall ſtones, without perceiving it had any operation on them. But when I came to apply it to one more, which looked ſomewhat duller than almoſt any of the reſt, I found, that it had in it particles enough of an iron nature to make it a magnetical body; and obſerved without ſurpriſe, that not only it would ſuffer itſelf to be taken up by the ſtrongeſt pole of the loadſtone, but when that pole was offered within a convenient diſtance, it would readily leap through the air to faſten itſelf to it.

I have elſewhere mentioned ſome other qualities of diamonds, as beſides their electrical virtue, this, that it is poſſible, that ſome of them may without fire or intenſe heat be brought to ſhine; though among all that I have tried, I found but two, that I could ſo make luminous. One of theſe belongs to the king, and is deſcribed at the latter end of our *Hiſtory of Colours*; and the other is a very ſmall one of my own; which either was quickly loſt among other ſtones of the ſame ſize, or quickly loſt its faculty of ſhining.

But

But to avoid repetitions, I ſhall here only add, that ſome few other obſervations, of a more particular ſort than thoſe delivered in the two foregoing pentades, may be found in other writings of ours, to which they ſeem more properly to belong.

CHAP. III.

Many changes of colour produced by one ſimple ingredient.

I KNOW not any way more likely to convince the generality of men, (who are wont to be much more impreſſed on by ſenſible phænomena, than theories, though ſolidly founded) how great an intereſt the variable texture of bodies may have in making them appear of differing colours, than by ſhewing, how the addition of a ſingle ingredient, that either is colourleſs, or at leaſt is not of any of the colours to be produced, is capable (and that for the moſt part in a trice) by introducing a ſecret change of the texture to make the body, it is put to, appear ſometimes of another, according as the parts of the body wrought upon are diſpoſed to receive ſuch a change, as modifies the incident beams of light after the manner requiſite to make them exhibit a blue, a green, a red, or ſome other particular colour.

Upon this conſideration I thought of ſeveral liquors, ſuch as aqua fortis, oil (as they call it) of vitriol, or inſtead of it ſulphur, aqua regia, beſides other ſaline liquors, that I ſhall not now ſtay to name, becauſe it may here ſuffice to tell you, that amongſt them all I made choice of the ſpirit (not that, which chemiſts call the oil) of ſalt, as that which is very ſimple, and which, if it be not too much dephlegmed, may be had clear and colourleſs enough. With this ſpirit I proceeded to make the following experiments upon ſeveral bodies, whoſe differing textures made me ſuppoſe, they would be fit for my purpoſe. And though I could not, without much diſadvantaging my deſign, forbear to mention ſome trials, that may be found elſewhere ſcattered among my writings on other occaſions; yet the greateſt part, by odds of thoſe laid together in this chapter, will, I preſume, be found new.

I. Some drops of well coloured ſyrup of violets being let fall together upon a piece of white paper, if a third or fourth part ſo much ſpirit of ſalt be with the tip of one's finger mixed with them, the ſyrup will preſently become of a red colour, uſually ſomewhat inclining to purple.

II. But if the liquor to be acted on be otherwiſe diſpoſed, it is poſſible with ſpirit of ſalt to turn it from a blue colour, not to a red, but to a green, as I have ſometimes done by letting fall into a deep ſolution of filings of copper made with an urinous ſpirit, as that of ſal armoniac, juſt as many drops of ſpirit of ſalt, as were requiſite and ſufficient to produce the change intended. I ſay juſt ſo many drops, becauſe a very ſmall error, either in exceſs or defect, may leave the mixture ſtill blue, or bring it to be all colourleſs.

III. Upon a quantity, not exceeding many drops of good ſyrup of violets, let fall two or three drops of good ſpirit of urine, harts-horn, or the like, or of oil of tartar *per deliquium*; and by mixing them well, the ſyrup has acquired a fine green colour, then by putting to it a little of the ſpirit of ſalt, and ſtirring it with the tip of your finger, you may turn the green ſyrup (as in the firſt experiment you did the blue) into a red.

IV. If you put a quantity of red roſe leaves well dried into a glaſs vial almoſt full of fair water, and ſoon after put to them as much ſpirit of ſalt, as will make the water pretty ſharp, you will quickly ſee, both that liquor and the contained leaves brought to a fine and lovely red, which ſcarlet colour it will retain for a great while. The like effect ſpirit of ſalt will have on ſome other vegetables of a ſtiptick or of an aſtringent nature.

V. But if by infuſing braſil in fair water, you make a tincture of it, which you may much deepen by dropping into it a little ſpirit of harts-horn, or of urine; if you then put to it a little ſpirit of ſalt, it will preſently change it from a deeply reddiſh colour, oftentimes like that of muſkadine, to a colour far more pale, or rather yellow, like that of the more dilute ſack; ſo that the ſame ſpirit acting upon two vegetable tinctures differingly diſpoſed, draws out and heightens redneſs in one, and deſtroys it in the other.

VI. If you make an infuſion of true lignum nephriticum in ſpring water, it will appear of a deep colour, like that of oranges, when you place the vial between the window and your eye; and of a fine deep blue, when you look on it with your eye placed between it and the window. But if you ſhake into this liquor a few drops of ſpirit of ſalt, the ceruleous colour will preſently vaniſh and appear no more, in what light ſoever you look upon the vial, though the liquor will ſtill retain the orange colour.

VII. We took common writing ink, and having let fall ſeveral drops of it upon a piece of white paper, ſo that when it grew dry in the air, ſome parts of the ink lay thick and ſome thinner upon the paper, whereon it did ſpread itſelf, we put a few drops of ſtrong ſpirit of ſalt, ſome on one part of the blacked paper, and ſome (or perhaps a ſmall drop) on another, and obſerved, as we expected, that in theſe places, where the ſpirit had been put, or to which it reached, the blackneſs was quite deſtroyed, and ſucceeded by an unpleaſant kind of colour, that ſeemed for the moſt part to participate of yellow and blue, neither of them good in its kind.

VIII. If in ſpirit of ſalt you diſſolve filings of ſteel, and ſlowly evaporate the filtrated ſolution, it will ſhoot into a kind of vitriolum martis, that will be green, as well as that which chemiſts vulgarly make with oil of vitriol. And to add, that on this occaſion, if you take theſe cryſtals made with ſpirit of ſalt, and when they are dry, keep them in a

crucible, you will find, that even a moderate fire if duly applied, will make them in a ſhort time exchange their green colour for a red, like that of the finer ſort of crocus martis, as indeed this operation makes them referable to that ſort of medicines.

IX. We took ſome mercury precipitated, *per ſe*, (that is, by the ſole action of the fire, without any ſaline additaments) and though crude mercury is not, as far as I have tried, ſoluble in our Engliſh ſpirit of ſalt; yet this red precipitate (which is ſuppoſed to be meer mercury) with its own ſulphur extraverted, did readily enough diſſolve in that liquor, and, if I very much miſremember not, did not at all impart its own colour to it: and I alſo found, that red-lead or minium being boiled a while in good ſpirit of ſalt, the redneſs did totally diſappear. So that the ſame agent, that produces redneſs in divers bodies, did in thoſe two, I have been mentioning, more than change it, ſince it quite aboliſhed it. Of which alſo I can give you an eaſier inſtance, by obſerving, that the reddeſt coral being diſſolved in our menſtruum, the redneſs vaniſhes, and the ſolution appears colourleſs.

X. Take filings of copper (the ſmalleſt are the fitteſt for this experiment), and having poured on them good ſpirit of ſalt till it ſwim, about two fingers breadth over them; keep the vial in a pretty ſtrong heat (in a ſand furnace) till you perceive the menſtruum has diſſolved a competent part of the metal: then warily take out the vial, and holding it between your eye and the light, you will perceive the ſolution of copper to be not like that of ſteel formerly mentioned, of a green colour, but of a dark and troubled one, oftentimes inclining to a deep, but muddy red.

XI. But if you pour this ſolution into a wide-mouthed glaſs, and let it ſtand for a competent time (which ſometimes amounts but to a few hours, and ſometimes to very many) the expoſed liquor will appear of a green, much finer than that of the cryſtals of Mars.

XII. Take filtrated and limpid ſolution of ſilver, or of mercury made in aqua fortis, and drop upon it ſome ſpirit of ſalt, by which you ſhall find the clear liquor turned white as milk, which after a while will let fall a precipitate of the ſame colour.

XIII. And if, inſtead of a ſolution of ſilver, or quickſilver, you take a red ſolution, or tincture of Benjamin, or of the reſinous part of jallap root, or you will alſo have, upon the affuſion of ſpirit of ſalt, a white liquor and a precipitate of the ſame colour.

XIV. Being deſirous to produce two differing colours at once by the ſame affuſion of ſpirit of ſalt, I infuſed ſome dried red roſe-leaves in fair water, till it had acquired a deep colour from them. To this infuſion, poured off warily, that it might be clear, I added a conſiderable proportion of the ſweet liquor, made by digeſting ſpirit of vinegar upon red-lead, by which I knew it would be turned of a blueiſh green. Upon this almoſt opacous liquor I poured ſpirit of ſalt, which, as I expected, precipitated the lead, that had been diſſolved in the ſweet liquor, into a very white powder, and gave the remaining liquor, well impregnated with particles of the roſe leaves, a very fine and durable ſcarlet colour. To which experiment I ſhall add on this occaſion, that, if it had been well made, you may barely by ſhaking very well together and confounding the white powder with the red liquor, make a carnation colour, which (when it is made as it ſhould be) appeared very fine and lovely whilſt it laſted, for in no long time the two ſubſtances, that compoſed it, would by degrees ſeparate, and re-appear each of them in its former place and colour.

XV. We took ſome ſpirit of ſalt, that having lain long upon filings of copper, had loſt the muddy tincture it had firſt acquired by being almoſt boil'd upon them. This liquor, I ſay, that looked like common water, we poured into a ſmall, but wide-mouthed cryſtal-glaſs, about half an hour after 8 in the morning, and leaving it in a window, it appeared after 40 minutes to have there acquired a colour, much like that of a German amethiſt, and ſeemed to have no tendency to greenneſs. But being detained by the viſit of a virtuoſo till eleven a clock, I could not ſee what happened in the mean time: but then, as he was going away, I invited him to ſee the liquor, which he (not knowing what it was) told me it looked of a graſs-green colour; wherein, though I were not altogether of his mind, yet in a ſhort time after, it did to me alſo appear of a lovely green; in its paſſage to which it had in all been expoſed about three hours and a half.

XVI. Precipitate a ſtrong ſolution of ſublimate (made in fair water) with a ſufficient quantity (and no more) of oil of tartar *per deliquium*. Put the liquor and powder into a filter of cap-paper, and when the water is run thorough, there will remain in the filter the precipitate, which is to be ſlowly and well dried. Then take it out of the filter, in the form of a groſs powder, and having put it into a clear glaſs, let fall on it warily ſome drops of pretty ſtrong ſpirit of ſalt, and (if the experiment ſucceeds with you as it did with me) during the conflict that will be made, the little lumps of the precipitate will loſe all their former brick-duſt colour, and turn white, though afterwards they will appear diſſolved into a tranſparent liquor, wherein the orange colour is quite aboliſhed.

XVII. Having calcined copper without any additament, ſave fire and water (by the way we elſewhere mention) we took an arbitrary quantity of it, and having poured on it about 3 or 4 times the quantity of good ſpirit of ſalt, we obtained (what we looked for) both a muddy, but manifeſtly reddiſh liquor, and (ſomewhat to the ſurprize of the perſons I had a mind to ſatisfy) a white powder, whoſe quantity bore a conſiderable proportion to the part, that was diſſolved (but whoſe qualities belong not to this place.) In which part its ſelf (to add that upon the by) by the affuſion of common water, and the action of the air, we afterwards produced more than one change of colour.

XVIII. We

XVIII. We ſometimes for curioſity ſake took a quantity, not exceeding a ſpoonful, of the dark brown or ſomewhat reddiſh ſolution of ♀, mentioned in the foregoing experiment; and having put it into a cylindrical vial, that the change of colour may appear the better, we poured on it 2 or 3 ſpoonfuls of totally ardent vinous ſpirit; and giving the glaſs a ſhake to mingle them, we preſently had (as ſoon as the mixture became clear) a lovely green liquor, which, when it was well ſettled, was very fair, and looked almoſt as if it were a liquid emerald.

XIX. We took ſome green taffatee ribband, and having moiſtened one part of it, that was not great, twice or thrice with good ſpirit of ſalt, we ſuffered it to dry of its ſelf; which it did in a ſhort time, and then we found, as we expected, that the wetted part was no longer of a green, but changed to a blue colour. But the ſame ſpirit (to add that upon the by) preſently turned that part of a piece of black ribband, upon which we put 2 or 3 drops of it to a colour not unlike that, which they call *fueille morte*, or, a fading leaf.

XX. It is uſual in paper-ſhops, and in divers other places, to meet with pamphlets and other thin books, that are covered with papers, that look ſometimes of a greeniſh blue colour, bordering upon purple, and ſometimes upon that of violets. Some of the deeper coloured papers of this ſort I have ſeveral times, to gratify ſome curious perſons, eſpecially of the ſex, held in my left hand, and with the other lightly and nimbly touched them here and there with the end of a feather (cut off from the reſt of the quill) dipt in ſpirit of ſalt, which almoſt in the twinkling of an eye, died the touched parts of the paper with a lovely red, that would ſometimes continue very vivid for for a good while, and be manifeſt at the end of divers weeks, if not months. And if inſtead of the forementioned quil, I took into my right hand (a bruſh, or) ſomewhat that was fit to ſprinkle with, and having dipt it in the ſaline ſpirit, made many drops at once fall upon the paper, it was pleaſant enough to behold, how ſuddenly and prettily it would be ſpeckled.

XXI. We took antimony well powdered, and poured on it three or four times its weight of good ſpirit of ſalt: we cauſed it to be boiled in this liquor (and that in a glaſs veſſel) wherein a part of it was diſſolved, and taken up into the menſtruum; where the antimony quite loſt its blackneſs. And this thus impregnated ſpirit of ſalt being dropped into fair water, the black mineral ſubſided immediately in the form of a very white powder or precipitate.

To theſe I might add other changes of colours, that I have made by the help of ſpirit of ſalt. But theſe being not of ſo quick and eaſy trial, (eſpecially becauſe ſome of them require ſkill in chemiſty) I thought it not fit to annex them, ſuppoſing, that thoſe already delivered, amounting to above four pentades, may ſuffice for the purpoſe declared at the beginning of this paper. And alſo to afford us this reflection, that it may not be amiſs, if phyſicians, chemiſts, and others, that are wont to compound drugs or other ingredients, would be leſs forward, than they uſually are, to mingle, not to ſay to jumble ſeveral of them together, either unneceſſary, or without due regard to the friendly and incongruous qualities, (in reference to one another) that the ſeparate ingredients may have. For moſt of us are but too liable to be miſtaken, when we preſume before-hand, what changes the coalition, or other aſſociations, of differing bodies may produce, eſpecially if they be either ſaline, or plentifully partakers of a ſaline nature; ſince experience frequently ſhews, that by the action and re-action, that are conſequent upon untried ways of compoſition, there emerge in the mixture new conſiſtencies and other qualities or accidents, that were not looked for, when the ingredients it is compounded of were put together. And though it may ſometimes happen luckily enough, that theſe emergent qualities, whether of drugs, or other comparatively ſimple bodies, may prove advantageous; yet this may well be looked upon but as a lucky chance, and hinders not, but that one may juſtly fear, that ordinarily the newly produced quality of a medicine may prove to be either worſe than was expected, or at leaſt other than was deſigned, and conſequently leſs fit for the phyſician's or the artiſt's determinate purpoſe.

CHAP. IV.

An advertiſement touching thoſe paſſages, that in this book relate to the art of medicine.

THE favourable reception the publick was pleaſed to give two editions ſet forth in one year of *The Uſefulneſs of experimental Philoſophy*, having encouraged the ſtationer to ſolicit me for a new impreſſion, I was on the ſame ground invited to think of making additions to divers parts of that treatiſe. But afterwards obſerving, that notwithſtanding the thanks and acknowledgments I had the good fortune to receive from ſeveral phyſicians, ſome of them of great reputation, (and perhaps by that only known to me) yet others were not well pleaſed, that a perſon not of their profeſſion ſhould offer to meddle with it, though with a deſign of advancing it; I, whoſe condition exempted me from taking upon me their calling, and who conſequently muſt want many opportunities, that others enjoyed, of making obſervations about the phænomena of diſeaſes and of medicines, ſuffered myſelf without much violence to be diverted to other ſtudies more ſuitable to my inclinations, as well as to my condition; and accordingly I laid aſide the papers I had written in reference to the phyſician's art; nor were it eaſy, or perhaps poſſible for me to retrieve them, after they have lain ſo many years diſperſed and neglected, by which means perchance divers of them have been loſt.

But all this could not hinder me from being preſſed to retrieve and communicate theſe

ſcattered

ſcattered and duſty papers by the ſecretary of the Royal Society, Mr. *H. Oldenburg*: for as this gentleman has been almoſt every where wonderfully ſolicitous to preſerve every thing from being loſt, that may any way contribute to encreaſe the ſtock of uſeful knowledge; ſo having got notice of theſe papers, and a ſight of ſome of them, his partiality for me made him much over-value them, and perſuaded him, that a collection of them, as incoherent and unfiniſhed as they were, might be of ſome uſe to the phyſician's art. And this ſeemed the more hopeful, becauſe natural philoſophy being a ſcience of far greater extent than phyſick, and ſupplying it with many of its principles and theories, it is very poſſible, that naturaliſts, though not profeſſed phyſicians, may propoſe ſome ſuch comprehenſive notions and methods, as may awaken and enlarge the minds of them that are ſo, and at leaſt afford ſome uſeful hints to conſidering and ingenious men. And in effect divers phyſicians, as well as many patients, have been pleaſed to declare (ſome in print, and ſome other ways) that ſometimes they found not uſeleſs aſſiſtances from ſome of thoſe papers, wherein I occaſionally touched on medicinal things. Such motives as theſe made Mr. *Oldenburg* ſo earneſt to procure the ſcattered fragments, that I might have yet remaining, about medicinal affairs; that though for the reaſons mentioned above, I could not think it fit to make a collection of papers ſo unlike in their ſubjects, ſo diſproportionate in their bulk, and ſo unfiniſhed and imperfect on divers ſcores; yet thus far I was content to comply with his deſires, that when theſe trifles came to hand, I would now and then inſert them among my *Experimenta & Obſervationes Phyſicæ*, (medicine being a part, or an application of natural philoſophy;) eſpecially if there were any great affinity between the paper I lighted on, and the ſubject I was then treating of; knowing well, that Mr. *Oldenburg*, and perhaps ſome others too, had rather I ſhould impart them at all adventures, than ſuppreſs what they judged might be uſeful; and that it was better to run the hazard of having them ſlighted, than loſt.

THIS advertiſement I thought fit to give in this place, once for all, that when hereafter there ſhall occur any thing among theſe *Experimenta & Obſervationes phyſicæ*, that directly relates to the phyſician's art, you may not think it ſtrange, remembring upon what account I ventured to meddle with things of that nature, and alſo that you may readily underſtand what I mean, when you meet with any particulars delivered, as thoughts, or deſiderata, or wiſhes, tending to, or aiming at the improvement of medicine; which how ſlight or ſuperfluous ſoever they may be to experienced maſters, to whom I did not preſume to recommend them, I thought might probably be ſerviceable to a very ingenious, but yet young cultivator of that noble art, (whoſe name I concealed, after the way of the curious of *Germany*, under that of *Trallianus*) for whoſe uſe they were intended.

The firſt PENTADE.

EXPERIMENT I.

A VERY tall and well ſet gentleman, aged about twenty four years, by a fall from his horſe, had his ſkull broken in ſeveral places; and being a perſon of good eſtate, had ſeveral chirurgeons to attend him in the courſe of his ſickneſs; during which he was divers times trepaned, and had ſeveral pieces of his ſkull taken off, which left great chaſms (that I have ſeen and felt) between the remaining parts. Within about three days after his fall, this knight (for ſo he now is) was taken with a dead palſey on his right ſide, which did not equally affect his arm and his leg; the uſe of the latter being ſometimes ſuddenly reſtored to him in ſome meaſure, and (though ſeldom) after a while almoſt as ſuddenly loſt: but his arm and head were conſtantly paralytical, being wholly deprived of motion; and having ſo little ſenſe, that it would ſometimes lie under his body without his feeling it. But if his hand were pricked with a pin, he could take notice of it. This palſey continued during almoſt the whole time of the cure, which laſted twenty three or twenty four weeks. And when the chirurgeons were going to cloſe up his head, as having no more to do; one of them, who was an ingenious man, and tenant to this gentleman, oppoſed all the reſt, alledging, that, if they did no more, the gentleman would lead an uſeleſs and very melancholy life; and that he was confident, the palſey was ſome way or other occaſioned by the fall, which had left ſomething in the head, that they had not yet diſcovered. And the knight himſelf, agreeing to this man's motion, his head was further laid open; and at length, under a piece of proud fleſh, they found, with much ado, a ſplinter, or rather flake, of a bone, that bore hard upon the *dura mater*, and was not pulled out without a great hemorrhage, and ſuch a ſtretch of the parts, as made the patient think his brain it ſelf was tearing out. But this miſchief was ſoon remedied, and his hurts ſecurely healed up; and he is now a ſtrong, healthy man, and finds no inconvenience by having ſo broad and various a callus inſtead of the ſkull, ſave that he is a little obnoxious to take cold in his head. But the memorable circumſtances, for whoſe ſake I mention this narrative, were theſe: when I aſked him, how big the bone was, that was laſt taken out? he told me, that it was leſs than half the nail of one of his fingers (not his thumb) and that it was almoſt as thin, being in ſize and ſhape like the ſcale of a fiſh; but that it did not in his head lie flat, but bore hard upon the *dura mater*. When I aſked him, how long after it was taken out, he began to feel ſome relief, as to his paralytic diſtemper? he replied, that in leſs than five hours he found himſelf, to his great joy, able to move his little finger; and (though this happened in the evening) he was the next morning able to move all his fingers, and within two or

three days after to lift up his arm: by which it ſeemed manifeſt, that ſo little a body, as the ſplinter lately mentioned, produced in ſo robuſt a perſon a palſey of the whole ſide it lay on. For when I particularly aſked him, whether, after the taking away of the proud fleſh, that encompaſſed the little bone, he did not find, if he found none before, ſome relief as to his palſey? he anſwered, that he found none at all, till the bone had been pulled out, which was not till a good while after the chirurgeon had been by degrees eating off the proud fleſh, that grew about it. But there was in this caſe another phænomenon, that I thought little leſs conſiderable than the former. For, remembring the important controverſy, that is agitated among modern phyſicians and anatomiſts, about nutrition by the nerves; and having thereupon aſked this knight, whether he did not find an atrophy in the limbs of his body, that were affected? he told me, that when he began to be paralytic on that ſide, it by degrees much waſted, and the paralytic leg was very much extenuated; but the arm and hand much more, ſeeming nothing but a ſyſtem of bones, with the ſkin paſted on them. And when I further aſked, if upon the removal of the bony ſplinter abovementioned, the atrophy of the parts did not alſo begin to leſſen; he anſwered affirmatively, and told me, that in no very long time his leg and arm recovered their wonted dimenſions; and in effect I (ſome days ſince) ſaw the reſtored arm well plumped up with muſculous fleſh, though the weather were exceeding cold. And he further told me, that he found no difference between the limbs that had been paralytic, and the others, except that they would grow ſooner and more ſenſibly cold in ſharp or froſty weather.

This gentleman anſwered me, (to add that upon the by,) that, during the courſe of his cure, he was very frequently (almoſt every ſecond day) let blood; that he wanted not appetite to his meat; that for the moſt part he ſlept indifferent well; and, which was more remarkable, upon ſo great a hurt of the head he did not vomit, nor had afterwards any convulſions.

II. Among other inſtances I have met with, that ſhew the great power, which ſudden paſſions of the mind may have upon the body, I remember, that a woman of middle age, complained ſadly to me of the miſchief, a fright had done her; for ſhe related to me, that, having taken along with her to a meadow by a river-ſide, a little boy, that ſhe was dotingly fond of, whilſt ſhe was buſy about the work ſhe came thither for, the child ſtole away from her, and went along the bank, to delight himſelf with the view of the ſtream; but being heedleſs, it ſeems, by circumſtances, that he ſet his foot upon ſome piece of ground, that the water had made hollow; upon which account, the earth failing under the weight of the boy's body preſſing it, that and he fell together into the river: in the mean time, the poor mother caſually miſſing her child, haſtily caſt her eyes towards the brink of the river, and not being able to ſee him there, ſhe preſently concluded him to be drowned, and was ſtruck with ſo much horror upon the ſudden accident, that tore from her a favourite ſon, that, among other miſchiefs, ſhe fell into a dead palſy of her right arm and hand, which continued with her, in ſpite of what ſhe had done to remove it, till the time ſhe complained of it to me, who had not opportunity to know what became of her afterwards.

III. On the other ſide, to ſhew, that violent paſſions, and even frights, may ſometimes, though very ſeldom, do good, as well as harm; I ſhall here add a relation, that was circumſtantially made me by the learned perſon himſelf, to whom the accident happened. I familiarly knew a gentleman, that lived to be an eminent virtuoſo, and to oblige many by his uſeful writings, who, when he was a youth, fell into a violent and obſtinate ſciatica, which continued with him ſo long, that it left him little hope of recovery; but the devotion of this young man's friends invited them to make him be carried, ſince he could not go, to church upon ſundays; and there it happened, that the town being a frontier garriſon, the guards were ſo negligent, that there was occaſion given to a very hot alarum, that the enemy was got into the town, and was advancing towards the church to maſſacre all that were in it. This ſo amazed and terrified the people, that in very great and diſorderly haſte, they all ran out of the church, and left my relator in his pew upon a ſeat, that they placed him, and whence he could not remove without help: but he being no leſs frighted than the reſt, as they forgot him, he forgot his diſeaſe, and made a ſhift to hamper off the pew, and follow thoſe that fled: but it quickly appearing, that the alarum had been a falſe one, his friends began to think in what a condition they had left him, and haſtened back to help him out of the pew, which, whilſt they were going to do, they, to their great ſurpriſe found him in the way upon his feet, and walking as freely as other men. And when he told me this ſtory, he was above forty years elder than when he was thus ſtrangely reſcued, and in all that time never had one fit of the ſciatica.

ADVERTISEMENT.

It is eaſy to be obſerved, that of the two kinds, into which chemiſts may be conveniently enough ſorted, the number is greater of thoſe, that are not profeſſed phyſicians, than of thoſe that are: and yet ſeveral of the former ſort are led by their more free curioſity, or their particular deſigns, to allow a large ſcope to their trials; and ſo in their experiments upon various bodies, to operate upon ſome of thoſe that may be reduced (either directly, or by fit applications) to the materia medica, and afford uncommon preparations: which, though deſigned for other purpoſes, may, by a ſkilful phyſician, with a light variation, and perhaps without any, be made to

afford good medicines: and therefore I think it may be no inconſiderable ſervice to the publick, if, by the leave and aſſiſtance of the authors, divers chemical experiments, that are not directly uſeful to their immediate purpoſe, were not (as is uſual) thrown away, but put into the hands of ſome ſagacious phyſician.

Upon theſe grounds, I thought my ſelf little leſs than obliged, to ſet apart now and then an experiment, that contained ſome uncommon preparation, which ſeemed applicable to medicine; and to try whether, though, being in the country, or in ſome other inconvenient circumſtances, I had not opportunity to prove it myſelf, the notice given of it might not happen to be of uſe to a ſkilful phyſician.

I shall therefore partly in this chapter, and partly (if God permit) in ſome following chapters and other writings, tender to ſuch a one ſome few of the experiments of this ſort, that I lately lighted on among my adverſaria, and that ſeemed not uncapable to be made of ſome ſervice to the phyſician's art.

Of the good and bad effects of theſe I ſhall be glad to be informed, that they may be either uſed more freely and improved, or corrected and quite laid aſide; and I deſire that this ſhort preamble may ſerve for a general one to all the other deſigned chemical medicines, that I ſhall venture to propoſe hereafter.

A deſigned chemical medicine.

IV. I know how much men are prejudiced in ſome whole countries againſt vomitive medicines; and I remember we have had here in *London* a phyſician of great fame and practice, that would turn over a patient to another doctor, if the caſe were ſuch, that the patient would needs make uſe of emeticks. And I readily acknowledge, that they are edged tools, that require a ſkilful hand, to employ them without danger of doing more harm than good. But ſince experience ſhews, that where the patient can bear them, and the diſeaſe requires them, they act more ſpeedily and effectually than other evacuating medicines; and ſince the generality of our phyſicians, not excepting ſome, that are juſtly reputed very cautious, do not ſcruple frequently to make uſe of the infuſion of crocus metallorum, though it do not ſeldom prove a remedy harſh enough; I ſhall venture, in compliance with ſome ingenious phyſicians, and others, that have often made uſe of a medicine, that goes under the name of my emetick drops, to communicate the preparation of them; without preſſing the uſe any otherwiſe, than by confeſſing, that divers practitioners of phyſick, of differing ſentiments, agree in aſſuring me, that they have not yet found any emetick to work ſo effectually, nor with more eaſe and ſafety, than this liquor; which ſome of them prefer by much to other antimonial vomits; and eſpecially to the infuſion of crocus metallorum.

In preparing my vomitive liquor, I have not always employed the ſame proportion of the ingredients it is made of, nor did I find it neceſſary to be nice in that matter. But the proportion I ſomewhat prefer, is to take two parts of well choſen and finely powdered antimony, and on theſe to pour three parts of the menſtruum, *viz.* ſp. ; which ought to be rather moderately ſtrong, than too much rectified. Theſe are to be diſtilled together in a glaſs retort, fitted with a receiver not very ſmall, till there come over a great part of the menſtruum, which will uſually, towards the cloſe, be accompanied with red flores (ſometimes copious enough) which being ſeparated by filtration through cap-paper, the clear tranſmitted liquor is to be put into a glaſs, not newly waſhed, but dry on the inſide, and to be kept cloſe ſtopt from all intercourſe with the air.

The doſe is uſually to a man or woman, eſpecially at the firſt time, from four or five, to ſeven or eight drops: but I know an ingenious phyſician, that gives to ten or twelve, or a few more drops, if the caſe be urgent; and by that means, he told me, that with a ſmall button-bottle, that I chanced to give him a little before, he did, in two or three hours, reſcue three gentlemen, that, by a very bad ſurfeit with very bad circumſtances, were ſuddenly brought into great danger of ſpeedy death, and carried to a neighbouring tavern, as being too ill to be carried home.

The vehicle may be a ſpoonful or two of wine, or black-cherry water, or (which divers perſons chuſe rather) of ſpring-water, drinking up the liquor immediately after, becauſe there will ſome precipitation be made; and then taking two or three ſpoonfuls of the ſame vehicle to waſh it down. It uſually begins to work early, and does it without cauſing near ſo much ſtraining as vulgar emeticks; and yet makes copious evacuations, and ſometimes ſo eradicative of the morbifick matter, that the phyſician lately mentioned, who cured the three gentlemen, having a poor patient, who had conflicted for above three years with an ague in ſeveral types, but moſt commonly quartanary, perfectly cured him with two doſes of theſe drops, and a julap made chiefly of the diſtilled water of a common vitriolick mineral. And this cure ſeemed therefore to me, when the phyſician gave me an account of the drops he had from me, the more conſiderable, becauſe the patient had made uſe of great variety of remedies; and particularly he devoured great ſtore of the Jeſuits bark, or cortex peruvianus (perhaps becauſe it was not well conditioned, or ſkilfully adminiſtered,) which ſometimes altered the type of his ague, turning it to a ſingle or a double tertian, and ſometimes kept off the fits for a while, when it was a quartan, but never cured him quite; and left him in a deplorable eſtate, wherein the emetick drops found him.

Though I ſent this medicine to ſeveral patients, in whom, thanks be to God, it ſucceeded more than ordinarily well; yet I durſt not venture to give it to children, or to very young perſons; but having gratified an inge-

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nious ſurgeon, of good practice, with a ſtock of it, the trials he made upon divers perſons, with great ſucceſs on other patients, imboldened him to give it to boys and girls, and afterwards even to ſeveral children; whereof he gave me good account, only he diſcreetly took care to proportion his doſes to the age and ſtrength of his patients, and not to give the whole doſe at once, but divide it into two or three parts, that if the firſt ſhould work within half an hour, or leſs, the ſecond ſhould not be given, or leſſened in quantity. And if neither the ſecond did work within about an hour, he added the third. And by this cautious method, he aſſured me, that he had ſuddenly relieved ſeveral children in bad caſes, and found not any miſchief or danger enſue upon the adminiſtration of it. But children being tender creatures, this is to be further and cautiouſly tried.

POSTSCRIPT.

HAVING had occaſion to keep by me ſome vials furniſhed with the emetick drops, longer than I thought I ſhould need to do ſo; I obſerved, that, in tract of time, there began to ſubſide a white powder, wherein a good part of the emetick faculty of the medicine may be ſuppoſed to reſide: therefore it will be beſt either to employ the liquor in no long time after it is made, or if one has not leiſure or conveniency to do ſo, to ſhake the vial well (that the powder may be raiſed and well diſperſed through it) juſt before it be adminiſtered.

A deſigned chemical medicine.

THERE are many, that having a high eſteem for chalybeat waters, ſuch as thoſe of the *Spa* and *Tunbridge*, which yet in many places are not to be had at all, and in few to be had well conditioned, are very ſolicitous to find ſuccedaneums to them. To gratify ſome ingenious perſons of this ſort, (and improve a caſual hint taken from a book of a ſomewhat like preparation propounded for another purpoſe,) I remember I employed a way of emulating ſuch waters, that anſwered the outward phænomena of colour and taſte, and ſeem by the paucity and harmleſſneſs of their ingredients like to be innocent medicines. I had no opportunity to make trial of them in phyſick, but finding, that ſome inquiſitive cultivators of that art valued them more than I did, I committed the experiment to paper, and now ſuffer it to come abroad, that it may be tried by phyſicians, and either rejected or made uſe of as ſucceſs ſhall direct. The experiment as I made it was this.

WE took one part of very good filings of ♂, and ten parts of good diſtilled vinegar. Theſe we put into a bolt-head, and ſtopped it well; and then in a mild heat of ſand we digeſted them for about two days, and afterwards augmented the heat till the liquor appeared of a deep orange colour, but yet tranſparent. Part of this tincture we poured off, and kept well ſtopped by its ſelf, becauſe though by a longer digeſtion, and a greater heat, we obtained a very red tincture, yet we did not ſo much value it, becauſe when the menſtruum is over impregnated, the metal uſually precipitates, and the fine colour is deſtroyed. Of the firſt reſerved tincture, we let fall four drops into ℥viiiß. (8 ℥ß.) of clear common water, whoſe colour was not thereby ſenſibly altered; and the vial containing this mixture being well ſhaken, that the tincture might diffuſe itſelf the more thoroughly, we kept it carefully ſtopped for uſe, as being our fictitious or counterfeit *Spa*. A ſpoonful or ſomewhat more of this, with about a quarter of a grain, or leſs, of good freſh powder of galls, would preſently afford a purpliſh tincture, like that of natural ſprings impregnated with Mars, ſuch as the water of the *German Spa*, or of *Tunbridge* in *Kent*: if one's mouth were waſhed with it, it was found to have, like thoſe natural chalybeat waters, a manifeſtly ferruginous taſte. *N. B.* Theſe artificial acidulæ are to be adminiſtred in no long time after they are made; for experience has informed me, that (at leaſt ſometimes) when I kept them too long, within not many days after they were made, they would loſe much, if not moſt of their briſkneſs and force. And I ſometimes perceive, that there would ſubſide to the bottom a certain red or reddiſh ſubſtance, as it were oker, which was a token of the degeneracy of the liquor; and ſome ſuch thing I have obſerved in ſome natural chalybeat waters too long or negligently kept. But our acidulæ may be ſo ſoon and ſo cheaply made freſhly, that the above mentioned inconveniency will ſcarce to the ſkilful ſeem conſiderable.

The ſecond PENTADE.

EXPERIMENT. II.

BECAUSE it may be on ſome occaſions of uſe to a phyſician, to have ways of diſcovering the adulterateneſs of bezoar ſtone, which for its dearneſs is often conterfeited, and not eaſily diſcerned to be ſo by the common ways of exploring, which uſe to be uncertain enough; it may not be amiſs to communicate a new way of trial, which it is unlike, that impoſtors have dreamed of, or, if they ſhould know it, can eaſily elude. And this I am the rather willing to do, becauſe the propoſed way may afford an uſeful hint to the ſagacious enquirers into the nature, and ſome of the preparations, that may be made of the bezoar ſtone; which though it be a drug too much magnified by ſome phyſicians, eſpecially thoſe that depend on it againſt the true plague; yet a phyſician of great experience, and rather a ſevere than any ways a partial judge of it, allows it to be an excellent remedy even in malignant and ill-conditioned fevers, at leaſt if they be not truly peſtilential. One of the ways I employed in treating the bezoar ſtone may be eaſily gathered from the enſuing tranſcript of one of my regiſtered experiments.

We took forty or fifty grains of choice oriental bezoar ſtone reduced to powder, and in a bolt-glaſs poured on it ʒvi. of good ſpirit of nitre, as well to try, whether this liquor would prove a fit menſtruum for this ſtone, as we found it to be for the calculus humanus, as for other purpoſes. And though this affuſion being purpoſely made in the cold, the liquor did not ſeem at firſt to work on the ſtone; yet ſoon after it fell violently upon it, and diſſolved the greater part of it, not without noiſe and a notable effervescence. The ſolution was almoſt red, and the glaſs being put in a digeſtive furnace, the whole powder was not only diſſolved, but being left a night or two in a north-window, it afforded divers ſaline concretions, much larger than could well have been expected from ſo ſmall a quantity of matter; and theſe cryſtals, whilſt they were yet in the glaſs, might eaſily be taken for cryſtals of ſalt-petre, ſo great was their reſemblance,

To manifeſt, how much the faculties of looſening and binding are relative things, and depend upon the diſpoſition of the body to be wrought upon, and ſo upon the congruity betwixt the agent and the patient, I know an ingenious gentlewoman, on whom cinnamon, which generally is a conſiderable aſtringent and ſtomachick medicine, has a quite contrary operation, and that in a ſtrange degree; inſomuch, that having found by two or three accidental trials, that a very little cinnamon ſeemed to diſorder her ſtomach, and prove laxative, ſhe reſolved once to ſatisfy herſelf, whether thoſe diſcompoſures came by chance, or no; and having ſtrewed ſome powdered cinnamon upon a toaſt, ſhe was going to put into her ale, upon eating the toaſt ſhe was copiouſly purged for two days together, and that with ſuch violence, that it put her into convulſion fits, and a kind of ſpaſmus cynicus, which ſhe could never be perfectly freed from being troubled with from time to time for three years, as was the other day averred to me, and divers others that know her by her huſband, who is himſelf a learned man and a profeſſed phyſician.

A prosperous phyſician, to whom I had recommended ſome things relating to his profeſſion, whilſt he practiſed it with ſucceſs in the capital city of *Ireland*, where at that time there raged a new and violent fever, whereof multitudes died, very few patients recovering of it, happily lighted on a method, that proved, through God's bleſſing, very proſperous. This doctor returning into *Ireland* ſome time before having been deſired by me to ſend me an account of ſome things relating to natural philoſophy and phyſick, that I named to him, wrote to me, in anſwer to ſome of my enquiries, a letter, out of which I thought fit to make this extract, becauſe I know not, but that it may give good hints towards the cure of ſome other ill-conditioned fevers.

Dublin, Feb. 27, 1682.

I HAVE employed ens veneris for the removal of a ſubſultus tendinum, in a perſon dangerouſly ſick of a febris petechialis, (a diſeaſe fatal to very man here for theſe twelve or fourteen months;) and found, that it anſwered my hopes in three or four hours after I gave it in conſerve of borrage flowers.

I have, ſince I came from *England*, thought of a method of curing the aforeſaid fever, which has not once failed me, though I made of it for ſixteen or eighteen ſeveral perſons, many of which would certainly die, if treated after the uſual manner in this caſe. If I ſhould tell you, from what obſervations and reaſonings I came to alter the method of cure, I ſhould be very tedious. I ſhall therefore at preſent wave that, and proceed to tell you, that when firſt I come to any ſick of this diſeaſe, if I find coſtive, (as generally they are) I preſcribe a gliſter, and after that an epiſpaſtick plaiſter ſix or ſeven inches broad, and eight or nine inches long, to be applied between the ſhoulders: the bliſter being well raiſed I order to be dreſſed carefully, ſtripping off the cuticula. This continues running till the fever is gone off, which is moſt commonly in ten or twelve days, if they have not kept up too long with it, and then we cannot certainly foretel the time of the fever's declination: for the whole time till the going off of the fever, I preſcribe emulſions of *aq. aronis, card. bened. citrij totius & ſyr. granatorum cum aceto.* I allow of orange and butter-milk poſſets, of roaſted apples, flummery, or any other light and cooling thing they call for.

By this method I keep the genus nervoſum and brain from being affected, and conſequently ſecure my patients; for as many as I have ever known of them die, that were troubled with this diſeaſe, died of a diſorder of thoſe parts. I do not defer the bliſtering plaiſters, as others do, till I find my patients delirious, lethargick, convulſive, or otherwiſe affected in their heads and nerves, finding by the experience of others, that then they moſt commonly prove ineffectual, becauſe of ſome morbifick matter's being too deeply lodged in theſe parts. I do not preſcribe, except upon ſome extraordinary occaſions, any volatile ſalts or ſpirits, or any thing too apt to quicken the already over-briſk circulation of the blood, having experimentally learned, that by theſe often uſed the brain and nerves become ſooner than ordinary affected, for as much as they deeply inſinuate themſelves, and drive with them ſome morbifick matter into the brain and nerves. I find bleeding bad, being generally fatal. If I doubt of the recovery of any of my patients ſick of this diſeaſe, it is only when I find, that they have been let blood, or lain for eight or nine days before I come to them; though I have brought through it even perſons in thoſe circumſtances.

A deſigned chemical medicine.

I shall not, becauſe I need not, diſcourſe of the medicinal virtues of ſteel, in a city, where many learned phyſicians do ſo much eſteem and employ chalybeat medicines as they do in *London*; and therefore I ſhall content myſelf at this time to offer you a

couple of preparations of ſteel, that poſſibly you have not met with or thought of.

1. CONSIDERING, that moſt of the ways made uſe of by chemiſts to prepare ſteel tend, by dividing it into very minute parts, to make it more liable to be wrought on by the liquors of the ſtomach, and ſome other parts of the body; and that the generality of theſe chalybeat preparations are wont to be made, only with acids, whether manifeſt, as oil of vitriol, ſpirit of vinegar, *&c.* or occult, as brimſtone, which though inſipid in its natural ſtate, when it comes to be melted diſcloſes its hidden ſalt, and works on ♂ by a ſharp acidity: conſidering this, I ſay, and that men have confined themſelves to acids in working on ſteel, becauſe they ſuppoſed inſtruments of that kind were neceſſary to diſſolve that metal, I thought it might do you, and ſome ingenious men of your profeſſion, ſome little ſervice, if I propoſed to you a way of opening the body of ſteel, that, though I gave a hint of it divers years ago, is, for ought I know, yet unpractiſed.

WE took then ſeveral ounces of highly rectified ſpirit of fermented (or putrified) urine *per ſe*, and conſequently without quick-lime, and poured it upon as much filings of ſteel freſhly made, to be ſure not to have any ruſty ones, as we gueſt, would at leaſt ſuffice to ſatiate it fully. Theſe we put in a moderately warm place, where the menſtruum wrought on the metal for divers hours together, and diſſolved a conſiderable part of it. This ſolution we ſet to filter, and found it of a taſte conſiderably ſtrong, but very different from any of the chalybeat preparations, we remembered, that were ſeen made with acids. The liquor being kept in a ſtopt viol for ſome days near a window, did in the cold let fall by degrees a conſiderable quantity of powder of a deep green colour, which ſurprized ſome virtuoſi, to whom I ſhewed it, eſpecially becauſe the liquor it ſelf was not of that colour; though at leaſt the ſuperficial part of what remained (in plenty) in the filter did alſo in the air acquire a green colour. But though our ſolution poured off from the ſubſided powder was warily and ſlowly evaporated, yet we did not find it would well cryſtallize. What uſe may be made in phyſick of preparations of this kind, I leave to you, whoſe profeſſion as well as curioſity will engage you to conſider. I do not preſume to tell you, but in general it ſeems, that ſteel prepared with volatile ſpirits of the animal kingdom, that are wont to be friendly to nature, and are very contrary to acids, may have new qualities very differing from thoſe of ſteel prepared with acids, and may be more ſafe in ſome caſes and to ſome patients. With what other volatile menſtruums I have diſſolved Mars, and what phænomena ſome trials I made with that metal opened by ſuch ſalts, you may command an account of, if you think it worth deſiring.

A deſigned chemical medicine.

ANOTHER experiment, that I made on ſteel, was deſigned to make as much of it volatile, as I could with a menſtruum, not ſo corroſive or dangerous to the body as oil of vitriol, or ſpirit of nitre, which, eſpecially the former, are employed by divers chemiſts to make chalybeat preparations, that yet are not volatile. The medicinal ſcope I had in my eye (for I had alſo a chemical one, that belongs not to this place) was to try, if I could by it obtain any ſulphur of Mars, which the commendations, that ſome, even of thoſe chemiſts, whether adepti or not, whoſe authority I moſt regard, repreſent as an excellent medicine, eſpecially in caſes that require anodynes, and which the others or the ſame ſpeak of as a graduatory ſubſtance (as to ſome metals) or both. If you ſhould aſk me, why I did not make uſe of the common vitriolum martis, which is eaſy to be had in the ſhops of chemiſts? I anſwer, that my deſign being to try whether or no I could obtain a ſulphur, that might properly enough (though not in the utmoſt rigour) be called ſulphur of Mars, that which is made the common way would not anſwer my end, ſince though I ſhould be able from this vitriol to obtain a real ſulphur; yet I ſhould not think it ſafe thence to conclude, that it came from the metal, and not from the menſtruum; becauſe I have ſeveral times from oil of vitriol itſelf obtained no contemptible proportion of yellow and combuſtible ſulphur. To which I add, that the acquiſition of a metalline ſulphur, though it was not the only thing that I aimed at in this preparation, for I preſumed, that at leaſt I ſhould make a very great comminution of the parts of ſteel, which is one of the main things aimed at by the more rational phyſicians in the preparations of that metal.

UPON theſe and the like grounds, I pitched upon good ſpirit of ſea-ſalt, as a menſtruum, much fitter for my purpoſe than either oil of vitriol, or the acid part of ſulphur; and accordingly in a good many ounces of this menſtruum, we diſſolved as much as we eaſily could of choice filings of fine ſteel; and having filtered the green ſolution, we very ſlowly evaporated it in a glaſs veſſel, and took ſuch care not to ſpoil the matter, that we had ſtore of fine green cryſtals, that were not very ſmall, and looked prettily: moſt of theſe we put into a ſtrong, but ſmall retort, and by degrees of fire, and a ſtrong one, for the laſt hours, we obtained divers ounces of a liquor, that came over in white fumes, like miſts driven by the wind, and afforded a ſulphureous ſmell: this liquor we rectified, and had a yellow ponderous ſpirit, that ſeemed to be much more of kin to the ſpirit of ſea-ſalt, than to the common oil of vitriol; eſpecially ſince being mixed with aqua-fortis, it would, like ſpirit of ſalt, make it a menſtruum, that would even in the cold diſſolve gold in thin leaves. Which laſt words I add, becauſe having put into a little of it already made yellow, by having diſſolved leaf-gold a very thin plate, but a pretty deal thicker than a leaf of hammered gold, the menſtruum made it look all over white, almoſt like ſilver, which ſeemed to argue, that this vitriolate menſtruum dif-

fered from common ſpirit of ſalt. And however, it may be worth taking notice of by the by, that not only vitriols blue, as is well known to chemiſts, but that vitriols of one of thoſe colours, and whereof the ſame metal is the baſeſt, may differ much from one another on the ſcore of the various, and to us, perhaps, unknown menſtruum, that diſſolves the metal, ſince our green vitriol yields liquors very different from common Engliſh vitriol of Mars made with oil of vitriol, though all the three be green. Which may give us ſome reaſon of the uncertainty, whereof vitriol is mainly employed; and it is perhaps worth remarking, that though we did not find the vitriol of Mars made the common way, nor even Roman vitriol to diſſolve in a vinous ſpirit totally inflammable; yet it would eaſily enough diſſolve our ſaline vitriol (if I may ſo call it) which ſolution (to hint that in *tranſitu*,) you may perhaps ſee cauſe to employ as a medicine in ſeveral caſes, and particularly as a ſtyptic in wounds, ſince its taſte is very aſtringent, its parts very ſubtil, and made fit by the vinous ſpirits to prevent corruption; eſpecially in thoſe climates, where chirurgeons complain, that they can ſcarce prevent the breeding of worms in wounds, unleſs they do betimes dreſs them with ſpirit of wine or brandy.

But that which we chiefly aimed at in this operation was the dry part, of what was elevated by the force of the fire. This we found to be diſtinguiſhable, partly by its ſituation, and partly by more durable accidents, into three kinds of ſubſtance; whereof one was almoſt like a powder, which after the contact of air, did in a while come over to be of a yellow colour, almoſt like ſulphur, but it was not indeed truly combuſtible ſulphur. The other ſubſtance conſiſted of larger parts, and was of a deep colour, between red and brown. But the third, which ſeemed the moſt copious of all, was made up of fine parts, larger than the former, of a deep reddiſh colour, and adorned with a fine gloſs, like that of ſcales of fiſhes, that looked very prettily.

The caput mortuum was found to be of a texture, that would have ſurprized moſt men; for a great part of it appeared to be turned into a talky ſubſtance, conſiſting of pretty broad and very thin plates, ſmooth and gloſſy, that lay upon, and againſt one another, like thoſe that make up Muſcovia-glaſs, when the pieces are more thick than large.

CHAP. V.

Containing experiments and obſervations ſolitary; in two pentades.

The firſt PENTADE.

EXPERIMENT I.

A notable comminution of gold into powder, that will ſink in water.

To manifeſt into how great a multitude of corpuſcles, groſs and heavy enough to ſink to the bottom even of a ſaline liquor in the form of precipitate or powder, I thought of this expedient. We took a grain of refined gold, and having diſſolved it without heat in a competent quantity of good aqua regia, we put to it by gueſs about two ſpoonfuls of water; and then by a thread we hung in the mixture a little bit of clean metalline body, and kept it ſuſpended in the liquor for many hours (or ſome few days.) By this means we obtained, as we expected, a precipitate of a fine and deep colour, ſo copious and ſo light, that it was a long time before it would all ſettle at the bottom. Then looking upon the remaining part of the ſuſpended metalline body, we found it ſo very little leſs than when the whole was firſt put in, that the diminution of it was not judged to amount to near a grain. By which experiment it appeared, that one grain of gold, not ſwimming in parts ſeparately inviſible, as it is in ſolutions, but reduced to a manifeſt powder, ſeemed to make a conſiderable quantity of precipitate at the bottom of the cylindrical vial, whoſe diameter was about an inch, that we kept it in. And this glaſs being a little ſhaken, the precipitate would riſe like a mud, and be ſo thoroughly diſperſed in the form of a powder through the whole body of the liquor, and a greater quantity of water added to it, that at firſt it would ſeem opacous, and after ſome time it would appear like a high and lovely purple ſolution. So that one grain of gold (for the colour argued, that there was ſome of that metal, in every corpuſcle of the precipitate) was reduced into as many grains of powder, as ſufficed to lodge themſelves in all the particles of ſpace great enough to be viſible, that were contained in a maſs of ſixteen drachms (i. e. two ounces) of water.

EXPERIMENT II.

A proof of the metalline nature of granates.

I have elſewhere endeavoured to ſhew, that divers, if not moſt, of the real vertues of ſome gems (for there are too many fabulous ones aſcribed to them) may in probability proceed from the particles of mineral juices, that were admitted whilſt the matter was yet in *ſolutis principiis*, or at leaſt ſoft, and afterwards coagulated with the lapideſcent part of the ſtone. In confirmation of this conjecture, I ſhall now obſerve, that having, upon ſome grounds not neceſſary to be here mentioned, ſuſpected, that granates contain (ſome of them) beſides ſome other metalline ſubſtances, divers corpuſcles of a martial nature; I made choice of ſome ſmall ones, which by their deep and almoſt dark colour (to name no other ſigns) I gueſſed to contain ſomewhat of iron or ſteel; and applied to them a pretty vigorous loadſtone, which, as I expected, readily took them up, and to which they conſtantly ſtuck afterward, till I forcibly ſeparated them from it. But though I tried this upon more parcels of granates than one or two, yet I found, that there was not many in one heap, that would eaſily adhere to the magnet.

EXPE-

EXPERIMENT III.

A GENTLEMAN eminent for his travels into eaſtern parts, and for his ſkill in jewels, told me, in confirmation of my opinion about the origin of gems from fluid materials, that he had ſeen a white ſapphir, that was a table-ſtone, as they ſpeak, *i. e.* flat and not cut in facets, about the middle of which there was a cavity about the bigneſs of a large pin's-head, or ſmall fitch, that contained in it a drop of liquor, that it ſeems could not be coagulated into ſtone with the reſt of the matter: which liquor, he ſaid, was very eaſily diſcernible by its ſhifting places in the cavity, when the ſtone was put into differing poſtures. And when I aſked, whether there was no flaw or commiſſure in the ſtone, at which the liquor may be ſuſpected to have got in; he aſſured me, that there was none, but that the cavity was every way encompaſſed by the ſolid ſtone, and was about the thickneſs of three barley corns beneath the upper ſuperficies of it.

SCHOLIUM.

IT may be here fit to give notice once for all, about the experiments, that are in the following collections ſtiled ſolitary, that though moſt of them are delivered nakedly as matters of fact, without any ſuch introduction or ſubſequent reflection, as may be met with ſometimes expreſsly, and oftner by intimation in divers others; yet that it ſhould not be thence inferred, either thoſe, that are ſimply recited, were lighted on by chance, or made at all adventures; or that they are of no uſe, becauſe for the moſt part there is not any expreſly aſcribed to them. For as they were not written without a particular occaſion and ſcope too, ſo that many of them may be applied to good purpoſes, will, perchance, be found here and there in our other writings. And to make it probable in general, that moſt of them may not be uſeleſs, it may perhaps ſuffice, that we refer to what we have elſewhere purpoſely diſcourſed about the uſes of experiments (even) to ſpeculative philoſophy.

THIS may paſs for a general ſcholium applicable to moſt of thoſe experiments, that are not attended with any particular ſcholium, nor any thing in the experiment or obſervation itſelf, that may eaſily, by an attentive reader, be made to ſupply the place of a ſcholium. Which laſt clauſe I add to intimate, that beſides my haſte, another reaſon, why ſo many ſcholiums, as may be expected in the following collection, will not be found in it, was, becauſe the proœmial part did, on ſeveral occaſions, make it needleſs to ſubjoin annotations.

EXPERIMENT IV.

AN ingenious and credible perſon (Mr. *W.*) aſſured me, that in one of the fine gardens near *Genoa*, that he delighted to viſit, there was a pond, which being made on the ſide of a hill, the wall next the bottom of the hill was ſo high, that men could not look over it into the pond, nor be at all ſeen over it by the fiſhes in the pond; and yet he has ſeveral times obſerved theſe fiſhes to be called together by the gardiner as he pleaſed, with a certain noiſe, that the gardiner made to aſſemble them, though neither he nor any man elſe could be diſcovered by the fiſhes, that readily obeyed their ſummons.

THIS relation may be of uſe in the controverſy, whether fiſhes hear under water.

EXPERIMENT V.

UPON occaſion of what is elſewhere ſaid of the production of vivid apparent colours by the breaking of the beams of light, on corpuſcles extraordinary minute, though ſolid; I took a globe of rock cryſtal, which being for a certain uſe ſawn in two by a cutter of gems, and having looked upon the flat ſurfaces, obſerved to the ſun beams, the little particles, that (notwithſtanding their ſeeming ſmoothneſs in the ſhade) aſperated their ſurfaces, did ſo retract and reflect the light, as to make them exceed the vivid colours of the rain-bow, (but in a ſomewhat interrupted manner) ſometimes on one part of the ſurface, ſometimes on another, as the ſurface happened to be ſituated in reference to the ſun.

AND having cauſed a choice and fine grained touchſtone to be likewiſe ſawn aſunder by the ſame artificer to make two of it, I obſerved upon the new ſurfaces made by this action, that to the touch ſmooth and poliſhed, ſuch vivid colours, as I lately mentioned to be when theſe ſurfaces were put into various poſition in reference to the ſun and eye; ſo that notwithſtanding the great tranſparency of the cryſtal, and great opacity of the touchſtone, their ſuperficial corpuſcles were found fit to exhibit (in due poſitions) the vivid colours we admire in the rain-bow.

The ſecond PENTADE.

EXPERIMENT I.

HAVING for leſs than two hours borrowed an *oculus mundi*, whoſe colour was white, whoſe figure was round and plain convex, and whoſe diameter I judged to be about a third part of an inch (rather leſs than more) I put it into a very ſhallow glaſs veſſel almoſt filled with fair water, and obſerved within one minute, or thereabout, with the minute-watch, that one part of the edge began to appear ſomewhat diaphanous, and the whole ſtone did by degrees loſe its whiteneſs, appearing of a dark browniſh colour: when this change had reached the whole ſurface, I looked upon my watch, and found, that the ſtone had lain nine minutes in the water; out of which having taken it, I perceived the body was grown ſemi-diaphanous, and the parts near the edge being leſs thick, appeared to have

10 Cent. 12.

have loſt much more of their former opacity, than the innermoſt part had. Then putting the ſtone preſently into the water again, I let it lie there ſo long till the time effluxed, ſince the beginning of the experiment, amounted juſt to half an hour. Then taking it out, and wiping it, I found it was grown much more clear, ſince being held againſt the light, it looked almoſt like yellow amber, but not quite ſo diaphanous. Then I expoſed it to the contact of the air, in the ſcales of a very good balance, (where it weighed four grains and about a quarter) and left it for a quarter, or near half an hour in that balance, to try if by the receſs of any imbibed aqueous moiſture it would become lighter; but want of time hindered me from compleating the experiment, but did not deter me from making another obſervation, which was, that within about a ſingle minute of an hour, a portion of the ſtone, near one part of the edge, was manifeſtly grown opacous and whitiſh, and within not many minutes after the whole ſtone began to appear in a changing condition, but did not change in every part at once, nor did the alteration make an uniform progreſſion; but here one might ſucceſſively diſcover divers white arches, or as it were zones, that were parallel enough to one another; and being quite opacous, intercepted between them other little zones, which being yet ſemi-opacous, appeared of a brown colour, and concurred to make the ſtone look like a very pretty agate, wherein the whiteneſs made a continued progreſs as long as the time permitted me to obſerve it: and the poſſeſſor aſſured me, that within an hour or two it would be all of a cream white (as he expreſſed himſelf) which I thought the more credible, becauſe I ſaw one part of it that was pretty broad, to have obtained already a whiteneſs, little, if at all inferior to that of ivory.

EXPERIMENT II.

Remarkable obſervations about hurricanes.

THE late governor of the *Bermudas* iſlands, (very much ſubject to hurricanes) in anſwer to my queſtions about the preſages of thoſe hideous tempeſts, informed me, that theſe were of the principal forerunners. Firſt, that the ſea would manifeſtly ſwell at ſome diſtance from the ſhores, inſomuch that the fiſhermen would divers times make to land, and warn the inhabitants, upon confidence of that preſage, to provide againſt that diſmal ſtorm, though the ſea were then ſmooth enough. Secondly, that the ſea would beat with great noiſe againſt the ſhore, eſpecially the rocks, though there appeared no manifeſt cauſe, as upon the account of the wind or tide, why it ſhould do ſo. And this ſign would ſometimes not appear till many hours, or perhaps a full day after that forementioned. And ſometimes it was obſerved, that the ſea would now and then ſuddenly invade the ſhore, and gain further upon it than could be accounted for by the wind or tide, and then quickly ebb away beyond the uſual low water-mark, and after return again with more fury, and fall back further than before. Thirdly, that ſometimes there would be perceived an ungrateful ſmell in the air, before the hurricane began to blow. And fourthly and laſtly my relator affirmed to me, both he and others had ſeen many bundles, as it were of long ſtreaks of differing colours, ſome whitiſh, ſome reddiſh, and ſome bluiſh, or greeniſh, which by reaſon of their figure are uſually called in thoſe parts horſe-tails: and theſe were ſeen in parts of the ſky, where the air was troubled indeed, but yet no formed clouds did appear to the eye.

EXPERIMENT III.

A monſtrous pearl.

YESTERDAY a curious perſon came to ſhew me a monſtrous pearl, if I may ſo call it, becauſe it was very irregularly ſhaped, and of an enormous bigneſs. For though it were ſo artificially ſet in gold, that by the help of a little of that metal fitly placed here and there, the whole jewel repreſented a lion; yet I made ſhift to meaſure it exactly enough with a pair of calapar compaſſes, (as they call thoſe, whoſe legs are made archwiſe) and found the length to be juſt an inch and an half, and the greateſt breadth (where yet it was of a proportionate thickneſs) to be $\frac{8}{10}$ or $\frac{4}{5}$ of an inch. The colour was orient enough, all but one dark ſpot, which by its ſize, figure, and ſituation, I gueſſed to be the remains of that part (whether like an umbilical cord or no) whereby it was faſtened to the naker or ſhell of the fiſh that produced it.

EXPERIMENT IV.

An odd obſervation about the influence of the moon.

I KNOW an intelligent perſon, that having, by a very dangerous fall, ſo broken his head, that divers large pieces of his ſkull were taken out, as I could eaſily perceive by the wide ſcars, that ſtill remain; anſwered me, that for divers months, that he lay under the chirurgeons hands, he conſtantly obſerved, that about full moon, there would be extraordinary prickings and ſhootings in the wounded parts of his head, as if the meninges were ſtretched or preſſed againſt the rugged parts of the broken ſkull; and this with ſo much pain, as would for two or three nights hinder his ſleep, of which at all other times of the moon he uſed to enjoy a competency. And this gentleman added, that the chirurgeons, (for he had three or four at once) obſerved from month to month, as well as he, the operation of the full moon upon his head, informing him, that they then manifeſtly perceived an expanſion or intumeſcence of his brain, which appeared not at all at the new moon, (for that I particularly aſked) nor was he then obnoxious to the forementioned pricking pains.

EXPERIMENT V.

An uncommon experiment about heat and cold.

Novem. 9. 89. To confirm what we have elſewhere delivered about the mechanical origin of heat and cold, we deviſed the following experiment; we took a ſmall and hermetically ſealed thermoſcope, whoſe ſtem was divided into parts, equal enough as to ſenſe, by little ſpecks of amel, that ſharp liquors might not eat off or ſpoil the marks. The ball of this inſtrument we put into a ſlender cylindrical veſſel, (called in the ſhops a muſtard glaſs) and more than covered it with ſtrong oil of ☉, and left it there a while to be reduced to the temper of the ſurrounding liquor. Then we caſt upon it by degrees, groſly powdered, ✻ which preſently was wrought on furiouſly by the menſtruum; and by this conflict, was produced a ſeeming effervescence, with great noiſe and ſtore of froth, which more than once was ready to run out of the veſſel. But for all this ſeeming ebullition, the mixture inſtead of growing hot, did really grow colder and colder, as appeared not only when the veſſel was touched by the fingers on the outſide, but by a ſurer mark, which was the deſcent of the coloured ſpirit of wine. How much further it would have deſcended, (for the liquor was not near ſatiated with the ☉) we were hindered from diſcovering, by an unlucky accident, that broke the thermometer, and put an end to that firſt part of our experiment. But this was no hindrance to the ſecond part, which for its novelty we mainly deſigned. For when we poured this actually and conſiderably cold mixture into three or four times its weight (by gueſs) of as much common water, that was likewiſe actually cold; this ſecond mixture did, as I expected, immediately grow ſo hot, that I did not like to keep my finger for a minute or two upon the outſide of the glaſs.

An advertiſement about the nature and ſcope of the chemical experiments contained in the following pentades.

CHAP. V.

Containing two pentades of chemical experiments.

BEFORE you enter upon the peruſal of the following pentades, I think myſelf obliged to give you notice, that you will be deceived, if you expect to find them conſiſt, either ſolely or mainly, of ſpagirical ſecrets, or difficult and elaborate proceſſes. I do not indeed deny, that I am not altogether unfurniſhed with ſuch, as in probability moſt readers would refer to experiments of that nature; and you may find divers of them ſcattered upon fit occaſions in ſeveral of my writings: but in the preſent tract, though I have not forborn to mention here and there as many particulars of that ſort, as I thought neceſſary to excite and maintain the curioſity, and ſuſtain the attention of a reader, that reliſhes nothing, that is not ſeaſoned with ſomewhat that is not common; yet in this treatiſe, wherein I aimed not to appear a chemiſt, ſo much as to make my reader a naturaliſt, it was more ſuitable to my deſign, though not more conducive to my credit, that the following pentades (which, God permitting, may, in tract of time, much encreaſe in number) ſhould mainly conſiſt of experiments, rather uſeful than ſpecious; my deſign being to contribute ſome ſound materials towards the erection of a ſolid and uſeful natural philoſophy. In making choice of which materials, I uſually prefer thoſe experiments, that afford the more light, to thoſe that appear with the moſt luſtre; and thoſe that are proper to encreaſe the reader's ſkill, to thoſe that make an oſtentation of the writers. On which ground it is, that whatever I may do, where I purpoſely recommend chemiſtry, I make this ſmall collection conſiſt mainly of ſimple and not intricate, or elaborate experiments; thoſe that are ſimple being not only more eaſy to be tried, and if need be, reiterated without much trouble, or danger of erring; but (which I more regard) more eaſy to be judged of as to their cauſes, phænomena and effects, and conſequently more fit to ground notions and reaſonings upon: divers of which may probably in the applications, that ſagacious perſons may make of them, prove to be of practical as well as theorical uſe. Thus though a wedge of gold and a diamond be, one more rich and finely coloured, and the other more precious and ſparkling, than a piece of ſteel and a flint; yet on many occaſions the two latter are far more ſerviceable to mankind than the former: ſince not thoſe, that are more prized for themſelves, but thoſe, that in compariſon ſeem deſpicable, afford ſparks, which do not only give light, but are fit to kindle fires, which both afford incomparably more light, and in the application are of excellent and neceſſary uſe in the kitchens of families, the forges of ſmiths of all ſorts, the furnaces of mine-men, and the laboratories of chemiſts.

The firſt PENTADE.

EXPERIMENT I.

To diſſolve crude gold with dry bodies.

BECAUSE the generality of chemiſts make ſo great a matter of *aurum potabile*, though they cannot deny, but that by their preparations it is not made irreducible; and becauſe alſo I am willing to grant, that even ſome preparations, that leave the metal reducible, may yet be of conſiderable uſe in phyſick, (the grounds of which opinion I elſewhere declare, and ſhall not here repeat) I will in this place ſet down a proceſs, which though I do not overmuch value, ſerved me well enough on ſome occaſions, to vie with thoſe, that much vaunted their particular ways (as they

they thought them) of making *aurum potabile.* I then told them, I could make one in an hour or two's time without a furnace, and that without any other diſtilled liquor whatſoever than common ſpirit of wine well dephlegmed.

This I did ſeveral times after the following manner. I prepared a ſaline mixture, conſiſting of one part of ſal armoniac, two parts of roch alum, and four parts of pure nitre. This being well pulveriſed and mingled, I rubbed diligently in a glaſs or marble mortar, with 15 or 16 parts in weight of the whole mixture of leaves of gold, ſuch as apothecaries and book-binders uſe. Then I put this into a ſmall new crucible, and putting a few, and but a few kindled coals round about it, and at a little diſtance from it to neal the veſſel; I ſoon after approached them, till the heat made the matter melt, and ſo with that gentle fire I kept it in fuſion, till it viſibly emitted no more fumes, but grew dry again.

This ſign appearing, I preſently took it off from the fire, and while it was yet warm, dug it out, as clean as I could; and having ſeaſonably pulveriſed it, that it might not attract the moiſture of the air, I put upon it ſome highly rectified ſpirit of wine, which within an hour or leſs time was ennobled with a rich golden colour. And accordingly I found it to be a real ſolution of gold, by divers trials, that I purpoſely made to evince it to be ſo.

Of this and ſome other leſs common preparations of ☉ more may be met with hereafter.

EXPERIMENT II.

Luna cornea by diſtillation.

There was taken ℥iii. of well refined ſilver, thinly laminated, and ſix of common ſublimate. This was put firſt into a retort, and the ſilver cut into ſmall pieces was put in after, that the matter lying uppermoſt might be penetrated by the aſcending fumes: but the fire having not been made ſtrong enough, the ſublimate was elevated to the uppermoſt part of the retort, and left the ſilver ſcarce at all changed in the bottom of the glaſs. Wherefore we put the ſame ſublimate and metal into another retort, and adminiſtring a ſtronger fire, that the ſublimate might be thoroughly melted before it could flee away, we obtained no running mercury at all, but the greateſt part of the ſublimate was elevated in its uſual form, leaving behind it the ſilver in a lump, which ſtuck hard to the bottom of the glaſs, and appeared much altered. For beſides, that there was acquired ℥i. in weight, many of the pieces of metal ſtuck together, and ſeemed at leaſt half melted, and were of a kind of horny and ſemidiaphanous ſubſtance, which would readily enough melt almoſt like ſealing-wax, when I held it to the flame of a candle, at which yet I could not perceive it manifeſtly to take fire.

SCHOLIUM.

It is here to be noted once for all, that in this and divers other chemical experiments, there is ſometimes much more delivered, than is neceſſary to make good the title, or the thing mainly intended. But it was thought fit, not to diſmember or mutilate the entire memoir as it was regiſtered, becauſe that of the other particulars ſome may be, though indirectly, referred to the principal part; and others may be looked on as phænomena, which may be of uſe at leaſt to me, by keeping me from forgetting them, and probably tend to the main deſign of all theſe experiments, *viz.* to contribute to a natural hiſtory, which may reſpect practice, as well as theory.

EXPERIMENT III.

Mercury grown warm with ſilver.

We took ℥ii. of animated (or antimonial) quickſilver, and put it into the palm of one's hand: we put to it by degrees a drachm and an half of powder of fine ſilver, made by precipitation with copper the ordinary way (but with more than ordinary care.) Whilſt this mixture was making with one's finger, he, that held it in his hand, confeſſed he found it grow ſenſibly warm; and I, whoſe finger was conſiderably warm, could not with it perceive any coldneſs in the amalgame. This in a very ſhort time became of a ſoft, and (as to ſenſe) uniform conſiſtence, and ſo ſoft, that it was like almoſt melted butter, inſomuch that we added half a drachm more of the calx of ſilver, without rendering the amalgame at all too ſtiff; and perhaps we might have added the other half drachm, without overcharging that penetrant mercury; in which caſe it had ſwallowed up full its own weight of ſilver, ſo different it was from common mercury; and when we left off, it had reduced into a very yielding form three quarters of its own weight of ſolid metal. This $\overline{aaa}$ we put into a ſmall vial, and ſtopped the glaſs with a cork, to obſerve, whether the amalgame would harden without intercourſe with the free air. Next morning it appeared to be concreted in the glaſs; and the next morning after that, we broke the glaſs to take out the matter, which we found conſiderably hard, but brittle enough.

EXPERIMENT IV.

The durableneſs of the faculty of a certain prepared mercury to grow hot with gold.

To convince thoſe, that treat the incaleſcence of prepared mercury and of gold, as a chemical chimera; I ſent, in a concealed way, to the Royal Society ſome mercury laboriouſly prepared in my furnaces, whereof ℥i. being put upon a due proportion of a calx of gold made by the common way, (quartation) they grew preſently, and very ſenſibly

hot in the palm of one's hand. I ſhall now add, that to try, whether this ſurpriſing faculty of growing hot immediately upon gold, will continue any long time in the mercury; I lately took ſome, that I had (for a certain purpoſe) kept hermetically ſealed in a glaſs egg for divers years, (if I miſtake not, ten or twelve at leaſt) and having reiterated the forementioned trial with it, firſt alone, and then in the preſence of a cultivator of chemiſtry; it preſently grew hot with the ☉ in the palm of the hand. And having diſtilled off the mercury, and tried it again, as well as ſome that was undiſtilled, if I much miſremember not, it did again heat with the gold.

EXPERIMENT V.

An uncommon way of operating upon ♁.

When chemiſts expoſe antimony, for inſtance, and divers other conſiſtent, but not fixed bodies, to the action of the fire, they are wont to do it in veſſels, either open, as when they make calx, or glaſs of antimony; or at leaſt in veſſels, that are not ſo cloſe, but that there is air included with the matter, as when they ſublime it in glaſſes, or in earthen ſubliming pots: and though they regard not this included air, becauſe uſually there is not much of it in the veſſel, yet it may have a not inconſiderable influence on the effects of the fire's operation, not only as it contributes to the aſcenſion and ſuſtentation of diſſipated parts of the mineral, but as it affords theſe corpuſcles room to fly to and fro in it, and thereby make aſſociations, or coalitions, and concretions, that otherwiſe would not be produced. Upon this account I gueſſed, that it may be, on divers occaſions, a thing of uſe for diſcoveries, and perhaps too for practice, to employ a method, that the body expoſed to the action of the fire may be kept from the contact of the air, at leaſt as to any ſenſible portions of it, and being as it were included in bodies almoſt equivalent to ſolids; and one may ſuppreſs the free emiſſion and aſcent of exhalations, and ſo to make an operation, not only in clauſo, but as it were in ſolido, and reduce the parts of the body expoſed, and perhaps the igneous corpuſcles, to act reciprocally upon one another, without any notable diſſipation, or avolation of parts.

To apply now what hath been ſaid to antimony, I ſhall briefly ſet down an uncommon way, that came into my mind of operating upon it. We took well powdered ♁, and well dried (white) chalk reduced likewiſe to powder: with theſe in a large earthen pot or crucible, we made SSS. having a care to make the lowermoſt and uppermoſt bed of chalk, and the laſt thicker than any of the reſt, as alſo that none of the antimonial layers were but of a moderate thickneſs, that the heat might penetrate them the better: then the veſſel being covered, was put among the kindled coals of a good digeſtive furnace, (not becauſe ſuch a one was neceſſary, but becauſe it was at hand) where it was kept for a competent time; which according to the bigneſs of the pot, and the ſtrength of the fire, may be ſometimes twenty or twenty four hours, ſometimes a day and a half, and ſometimes two days or better.

The ſecond PENTADE.

EXPERIMENT I.

A very uncommon way of making a calx of gold.

It is known, that moſt chemiſts, and many phyſicians, have a ſuperlative eſteem for the medicinal virtues of gold, and the preparations of it. And upon this ground, divers of them have long been, and ſtill are ſolicitous to make calces of gold by differing ways, moſt of them laborious, and ſome of them ſcarce to be ſafely wrought and uſed in phyſick. Wherefore I ſhall, I preſume, be eaſily pardoned, if I here ſet down a way, that came into my mind, and that I have ſometimes uſed to make a preparation, wherein gold is reduced to very minute parts, without the help of mercury, or of any precipitation made by ſharp ſalts, whether acid or lixivial.

We took then refined gold, and diſſolved it in clean and ſpirituous aqua regia; and inſtead of precipitating the clear ſolution with oil of tartar *per deliquium*, as is uſually done, or with ſpirit of ſal armoniac, or other volatile urinous ſpirits, we firſt with a very modeſt heat drew off the ſuperfluous liquor; whereby the gold, with the remaining part of the menſtruum, was left in the appearance of a thick and oleous liquor. This done, we poured upon it a treble weight of vinous ſpirit totally inflammable, and in a ſhort time we had, as we expected, a very ſubtil powder, or high coloured calx of gold, that ſubſided at the bottom; the menſtruum being ſtrangely dulcified as to taſte, and become fragrant in point of ſmell. When a very few days were paſt, we decanted the liquor, and put on it freſh ardent ſpirit, and leaving them a while together, there ſubſided the like well coloured calx more plentifully than the firſt time.

I know not, (to add that upon the by,) whether it may or may not be worth while to try to diſcover, whether this dulcified A. R. ſpirituoſa being drawn off from the ſubſiding gold, may have acquired any virtue from the opened metal; ſome trials ſeeming to argue, that the openneſs of this calx made it fit to be eaſily wrought upon by a menſtruum, that would not touch water-gold, as they call the common calx made by quartation, nor yet leaf-gold, ſuch as the apothecaries employ; but however the menſtruum has acquired ſuch qualities, as make it ſeem likely to prove an uſeful medicine, which yet I refer to trial.

By the way we pitched upon to make this powder of gold, it ſeemed probable, that it would not (at leaſt) be leſs ſubtil, and yet would be more mild than common preparations; and nevertheleſs we thought it might, perhaps, make it yet more ſecure, if we ſhould, as we did, put upon it a totally ardent

dent vinous ſpirit, and burn it off once, twice, or thrice, to carry off with it any little corroſive or ſaline particles, that may have ſtill adhered to the metalline ones.

N. B. The ſpirituous aqua regia, mentioned in the proceſs, is ſo called by me, partly to diſtinguiſh it from the common aqua regia, and partly becauſe it is indeed of a more ſpirituous nature than the common, being compoſed without any groſs ſalt, ſuch as ✱, but only of ſpirits. This menſtruum I made for ſome particular uſes: and though it works more ſlowly than the common chryſulca, yet I often prefer it to this, as that which I can employ to ſome uncommon purpoſes; and as it may probably be a more innocent menſtruum in making preparations of Sol, deſigned for medicinal uſes. I make it very eaſily, by mixing one part of good ſpirit of ſalt with two parts of ſtrong ſpirit of nitre, or (when it is not to be uſed for medicines) of common, but clean aqua fortis.

SCHOLIUM.

The above recited trial was made as it is delivered; but ſome circumſtances, that I took notice of, and particularly ſome grains of powder, that, though mingled with the reſt, were ſhining, as if they had been extremely minute, and bright filings of gold: theſe circumſtances, I ſay, made me ſuſpect, that the ſucceſs might much depend upon particular and nice circumſtances, that may need more exact trial, than I had then occaſion to make; and therefore it may be fit, that the experiment be heedfully repeated. It may alſo be tried, whether the employing common A. R. inſtead of ſpirituous, will much vary the experiment.

EXPERIMENT II.

To try how much volatile ſalt an aſſigned quantity of water would diſſolve, we took ℥iii. of diſtilled water, and put into it by degrees ſome dry ſalt of ſal armoniac, (that was very white, and compact enough) keeping the liquor in digeſtion for a pretty while, that it might have time to diſſolve as much as it could. When we found it would diſſolve no more in a moderate heat, we took it off, and found, that after ſtanding ſome hours in the cold, there fell to the lower part of the glaſs, and ſettled there a pretty quantity of ſalt, which we gueſſed to be about ʒii. which being deducted from ℥ii. that had been in all put in, there remained ℥i. and ʒvi. in the liquor, which by this account had diſſolved at leaſt half its weight of ſalt.

SCHOLIUM.

I desire it may not be thought ſtrange, if, among our chemical experiments, ſome few ſhall be here and there met with, that are much leſs elaborate or promiſing than others, that I could eaſily have inſerted in their rooms; for I did it on ſet purpoſe, partly becauſe oftentimes (as was intimated at the beginning of the chapter) ſome more ſimple or ſeemingly leſs valuable experiments may be fitter materials, than more curious ones, for the natural hiſtory we would promote; and partly to give an example, if mine can ſignify any thing, of not diſdaining to regiſter ſome things, that ſeem mean, if by the light they afford, or the uſes they may be applied to, they compenſate the want of luſtre, and of immediate utility. And the ſubſtance of this ſcholium I deſire may be mentally transferred, as occaſion ſhall require, to thoſe following chapters, that treat of chemical experiments.

EXPERIMENT III.

Perhaps ſome chemiſts will think, that the following memoir may give hints, that may be of uſe on ſeveral occaſions, both for other purpoſes, and for theirs, that would draw tinctures from ſeveral bodies, that will not afford them in ſimple ſpirit of wine though well rectified.

The ſimple ſpirit of good French verdegreas, being once or twice abſtracted from as much ſalt of tartar as it would diſſolve in the cold, left the ſalt eaſily fuſible, and diſſoluble in highly rectified ſpirit of wine.

EXPERIMENT IV.

I have not been unacquainted with ſome curious and elaborate preparations of that noble flower the roſe; and experience hath convinced me, that it is poſſible, whatever moſt chemiſts think of it, to obtain from roſes a true eſſential oil, that mixes not with water, and is exceeding fragrant: but there are ſeveral, that are ſo far from believing, that an eſſential oil may be obtained from roſes, without being in the form of a butter, but in a liquid one like oil of cloves, or wormwood, that they doubt, whether a true ſpiritus ardens can be obtained from them, without addition of wine, or ſome ſuch inflammable liquor. I ſhall here tranſcribe the following note, as containing a more ſimple and eaſy preparation (than any of thoſe before mentioned) of the ardent ſpirit of thoſe flowers, and therefore more ſuitable to the deſign of the whole chapter.

To make an inflammable ſpirit of roſes.

Two buſhels of damaſk roſes (together with a good number of red roſe-buds) being beaten, and put into a veſſel with water, amounting to about four gallons, were mingled with about a quart of ale-yeaſt, and kept in fermentation for about five or ſix days (the weather being cold for the ſeaſon) and then being diſtilled *per veſicam*, afforded us a ſpiritus ardens.

EXPERIMENT V.

An experiment about the chemical analyſis of pearls.

We took ℥ii. of ſeed pearl, that were carefully bought for oriental, and without breaking them, put them into a retort, and diſtilled

them in a ſand-furnace by degrees of fire, giving a ſtrong one at the laſt. By this means we had a little black oil ſwimming upon the ſpirit, which was alſo dark and muddy, as if incorporated with ſome more oil. The weight of both theſe liquors was twenty three grains, beſides which there ſtuck to almoſt all the upper part of the retort a thin film of oil, which together with a ſtreak of the like reaching to the bottom of the receiver, we eſtimated at three grains more, and ſo reckoned twenty ſix grains for the weight of the whole aſcended matter. The caput mortuum amounted to full the remaining weight of two ounces. The empyreumatical liquors, that came over, ſmelled much like thoſe of harts-horn, and the ſpirit was found to belong, as we expected, to the tribe of urinous ones, or, as many now call them, volatile alcalies. For it readily hiſſed and produced bubbles, with good ſpirit of ſalt, turned ſyrup of violets green, and being dropped into ſolution of ſublimate, turned that white; to omit another way or two, by which I examined it. The oil, that ſtuck to the retort, and which was fœtid, like that of harts-horn, did eaſily diſſolve in dephlegmed ſpirit of wine, and afforded a reddiſh brown ſolution. The caput mortuum was very black, and ſome grains of it were found readily enough diſſoluble in ſpirit of vinegar. Being calcined in a well covered crucible, with a ſtrong fire, (for a moderate one will not do it, unleſs it be long) we reduced them to be purely white, and to a weight leſs by ſome grains than an ounce and ʒiii. and we found, as we expected, that being pulveriſed, this calx taſted hot and biteriſh upon the tongue, like good calx vive, and was not only of an alcaliſate, but a lixivial nature: for beſides that it preſently turned ſyrup of violets green, it quickly afforded an orange coloured precipitate, with ſolution of ſublimate.

STRANGE REPORTS,

In TWO PARTS.

Addreſſed to a Virtuoſo, Friend to the AUTHOR.

ADVERTISEMENT.

I PRESUME, Sir, you may yet remember, what I wrote about the nature and ſcope of my collection of *Strange Reports*, in an eſſay, which takes its title from them; and which I was encouraged to make by the example of *Ariſtotle* *. And therefore I ſhall deſire, that to ſave your trouble and my own, that paper may ſerve for a preface to that which follows. About which, ſuppoſing this requeſt to be granted, I ſhall need to give you at preſent but this ſhort advertiſement; that for diſtinction's ſake, I thought fit to divide the enſuing particulars into two parts, becauſe they are indeed of two ſorts; one relating to things purely natural, and the other conſiſting of phænomena, that are, or ſeem to be, of a ſupernatural kind or order.

THE firſt ſet of particulars belonging to each of the two forementioned parts has prefixed to it the title of the firſt ſection, though it be not at this time attended by a ſecond; becauſe it is deſigned, that, God permitting, it ſhall be ſo hereafter, when I ſhall get time to pick up out of my *Adverſaria*, and other memoirs, particulars fit to have placed in the liſt of *Strange Reports*.

I MUST likewiſe give you notice, that you are not to expect the ſecond part at this time; diſcretion forbidding me to let that appear, till I ſee what entertainment will be given to the firſt part, that conſiſts but of relations far leſs ſtrange than thoſe that make up the other part.

* This famous philoſopher in his little tract, whoſe title ſome render *De Mirandis Auditionibus*, ſcrupled not to compriſe without method divers reports, uncertain or fabulous, nor to inſert ſeveral, that were not ſo cautiouſly admitted, as thoſe recited in the following collection.

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STRANGE REPORTS.

PART I.

SECTION I.

RELATING to a judicious virtuoso, that a physician of *Brussels* a while since affirmed to me, that he himself had prepared three or four resuscitable plants, one of which he had presented to the marquis of *Castel Rodrigo*, now governor of the Spanish Netherlands, where this virtuoso had not long since been: relating this, I say, to this gentleman, and enquiring of him, whether he had seen this resuscitable plant; he answered me, that he had never seen nor heard of it; but told me on this occasion, that coming to *Deal* with an apothecary of *Namier*, if I misremember not the name, much esteemed for his extraordinary skill in chemistry about some choice preparations, wherewith this man's shop was furnished, the apothecary told the virtuoso, that he had really prepared resuscitable plants, a different way from that which others pretended to, and that he could prepare a great variety of them. And when having enquired of the virtuoso, whether he himself had seen any of these prepared plants, he assured me, that he had seen not only some, but many. I then upon farther enquiry, how they appeared, learned, that the chemist had divers of them in distinct glass bottles; that the apparitions, that were exhibited, shewed not the peculiar colours, but only the shape of the plant; but this so genuinely, that he could perfectly distinguish, and easily know it to be such or such a plant, instancing particularly in carduus benedictus, and camomile.

And the difference betwixt this way of exhibiting plants, and that which is mentioned by *Quercetan*, and pretended to by others, I found by this gentleman's answers, to consist chiefly in these two things: the first, that the apothecary's plants did not, as the others, seem to grow up into the air included in a sealed vial, but were seen as growing in a clear liquor, wherewith the bottle that contained it was almost filled; and the next, that whereas to make the apparition, mentioned by *Quercetan*, and others, the application of an actual heat (as that of a lamp, or the sun-beams, or the like) is affirmed to be requisite, upon the absence of which the phantastical plant relapses into its ashes; in the formation of the apothecary's vegetables, he doth not employ any actual heat, but (which may seem more strange) only the shaking of the bottle; upon that agitation, the prepared ashes or powder being raised from the bottom, and dispersed quite through the liquor, when the glass is set by in a quiet place, the scattered particles by degrees so convene, as to compose a model of the plant they once belonged to. And heat not being requisite to their formation, these plants do not quickly, as the Polonian physician's fantastick vegetable, recorded by *Quercetan*, fall back into a powder; but, if let alone, continued a great while, until the preparer think fit by a gentle agitation of the bottle, to dissolve the loose contexture of it.

RELATION II.

I met the other day with a very intelligent person, well versed in chemistry, not credulous, and in a word very well worthy of credit, who assured me, that he had himself seen a few years ago at *Mentz*, in the hands of one monsieur *P——r*, a gentleman of *Switzerland*, and a virtuoso, a piece of glass about the bigness of a shilling, or somewhat bigger, which was red and pretty transparent like glass of antimony made *per se*, and which this monsieur *P.* affirmed to the relator, that he hammered before the present elector of *Heidelburg*, (to whom, I told him, I had the honour to be known, and) by whom the relator was about that time employed. And this monsieur *P.* being his intimate acquaintance, and perceiving, that he was (as he well might be) indisposed to believe so strange a thing, after he had confessed the glass to have been given him by an excellent chemist in his country (*Switzerland*); this gentleman, I say, at the relator's earnest request, gave him leave, for his satisfaction, to lay the piece of glass upon an anvil, and to strike seven or eight strokes with a hammer upon it; by which means he found, that though it was not malleable (at least in the state it then was) like nealed silver, since it began to crack at the edges like silver, that is over-hammered; yet it did really stretch under the hammer, growing more thin on the beaten part, and having visible marks or impressions made on it by the edge of the hammer.

RELATION III.

A pious and learned schoolmaster, that ventured to stay in *London* in the great plague 1665, and was much employed, as some friends of mine, that knew him, and commended him, assured me, to visit the sick, and distribute alms and relief to them, went indiscriminately to all sorts of infected, and even dying persons, to the number, as he told me, of nine hundred, or a thousand; and being asked by me about the infection of other things than walls, he told me, that being once called to administer some ghostly comfort to a poor woman, that had buried some children of the plague, he found the

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room ſo little, that it ſcarce held any more than the bed whereon ſhe lay ſick, and an open coffin, wherein he ſaw her huſband lie dead of the ſame diſeaſe, whom the wife ſoon after followed. In this little cloſe room they affirmed to him, that the contagious ſteams had produced ſpots on the very wall; and when I aſked, whether he himſelf had ſeen them, he anſwered, that he had not; but yet was inclined to believe the thing to be true, not only upon the ſcore of the relators, but becauſe he had obſerved the like in his own ſtudy; which being divided only by a wall from ſome rooms of a houſe, which the owner had turned into a kind of a peſt-houſe, and in which numbers had died in a ſhort time, he took notice, that the white wall of his ſtudy was (ſince the ſickneſs raged, without any other cauſe that he could imagine) blemiſhed in divers places with ſpots, like thoſe of infected perſons. When (to add that upon the by) I enquired what antidote he uſed, he replied, that next the protection of God, which ſo many ſad objects made him the more fervently implore, and a conſtant fearleſſneſs, the only preſervative he uſed, beſides good diet, were half a ſpoonful or a ſpoonful of brandy five or ſix times a-day, eſpecially when he went into infected places, and the bigneſs of a ſmall nut, or leſs, of a root of Spaniſh angelica, of which he held in his mouth the quantity of a pepper-corn, or ſomewhat leſs, as often as he thought there was need.

RELATION IV.

January 25. AN ingenious perſon, and very worthy of credit, informed me the other day, in anſwer to ſome queſtions that I propoſed to him, that he was employed ſome years ago by a German phyſician (whoſe name he told me) to diſtil a certain mineral not unknown to me, which he performed in a naked fire, with ſo good ſucceſs, that he had from about half a pound of the mineral, near ʒiii. of the liquor: this he included in a glaſs with a bubble, and a ſlender neck like one of my weather-glaſſes; but though the liquor at firſt reached not above the bubble, but only filled it to the bottom of the pipe; yet as the moon increaſed, this liquor, as the doctor expected, by degrees expanded itſelf in the glaſs; ſo that about the full-moon, it reached about an inch into the pipe, and upon the decreaſe of the moon, it ſubſided by degrees to the bottom of the pipe. And when I aſked, whether the veſſel were carefully ſtopped; he anſwered, that it was not only ſo, but hermetically ſealed like one of my thermometers with ſpirit of wine, which he had ſeen. This the relator averred to me upon his own obſervation; and being deſired, he readily gave me a deſcription of the mineral, and a direction where to procure it, (which I am now endeavouring to do) adding, that the ſame doctor made the like trial with another mineral akin to this, with which my having heard, that ſuch an experiment had been done, gave me occaſion to propoſe him the queſtion.

RELATION V.

AN inquiſitive traveller, that not long ſince waited on a German prince addicted to chemiſtry, and was employed by him in his private laboratory, being aſked by me ſome queſtions about ore of biſmute or tin-glaſs, whereof there is ſaid to be a mine in that prince's territories, and in particular, whether he had obſerved any thing of the varying bulk of a ſtrange liquor obtainable from it; he anſwered me to this effect, that he had had occaſion to make many trials upon this mineral, and that particularly, by his prince's command, he had diſtilled a conſiderable quantity of a certain ſort of it, (becauſe it yields but very little ſpirit) and that he thereby obtained a liquor, which being by rectification freed from its ſuperfluous phlegm, amounted to about half a pint. This liquor was put into a vial, which it almoſt half filled. This vial being exactly ſtopped, was ſet aſide in a quiet place, where, (as the prince expected) as the light of the moon increaſed, from the new moon towards the full, ſo this liquor gradually ſwelled, and that not in a hardly perceptible degree, but very manifeſtly and conſiderably; ſo that when the moon was full, the liquor reached almoſt to the top of the glaſs, and during her wane, as the light decreaſed, ſo did the bulk of the liquor, which was always leaſt at the new moon. I aſked him, if any trial had been made, whether the weight of this ſpirit varied with the bulk, and he frankly confeſſed to me, that it had not come into his mind; but for what is above related of the increment and decrement as to quantity he affirmed to me, that himſelf, as well as his prince, had ſeveral times obſerved it; and he alſo readily told me the way he uſed in making the diſtillation, which, he ſaid, exacted an intenſe degree of fire.

RELATION VI.

AN inquiſitive perſon, that having gone through his ſtudies in the univerſity, travelled through divers countries, to make himſelf the more fit for the profeſſion of phyſick, anſwered me, that having reſided for ſome time in *Pruſſia*, he had more than once or twice (and that in differing places) obſerved, as others in his company alſo did, that the fiſhermen in breaking the ice of long frozen places, and taking out thence conſiderable maſſes of ice, did ſeveral times find in them ſwallows, ſometimes numerous enough, that were ſo incloſed in the ice, that unleſs by breaking, or thawing it, they could not be gotten out of it. And he further anſwered me, that when theſe lumps or maſſes of ice came to be thawed in their German ſtoves, the ſwallows, that lay as dead before, would revive, and perhaps fly about the room, but did not long ſurvive their recovery out of their inſenſible ſtate, ſome dying again in few hours,

hours, others the next day, or perhaps the third; but few or none, that he obſerved, living beyond the fourth or the fifth; which immature death my relator judged to be cauſed by their having no appetite to eat, which inappetency made them die ſtarved. But as the conjecture may be true as to thoſe, that lived for ſome days, ſo it ſeems not like, that thoſe that periſhed in few hours, died merely of hunger; and as for them, that were ſtarved to death, I ſhould ſuſpect, that they were ſtarved, not ſo much for want of appetite, as for want of ſuch animals as they uſed to feed on, eſpecially flies, which they could not get in winter.

RELATION VII.

AN inquiſitive gentleman lately returned from *Jamaica*, where he was employed by the governor to make diſcoveries of natural things, anſwered me this morning, that he had ſeen in that iſland great number of trees, that bear the ſilken cotton; that he found many of them to ſurpaſs in bigneſs and height the larger ſort of our Engliſh oaks; and that on a mountain, that many went to viſit, out of curioſity, to view a ſtupendous ſilk-cotton tree, he ſaw its bulk, and many affirmed to him, and it was the general tradition of the country, which he ſaw no cauſe to diſbelieve, that this prodigious tree was in the body no leſs than twenty one yards about, that is, more than ſixty foot in compaſs.

THE ſame curious traveller told me, he ſaw a canoo made of the hollowed trunk of one of theſe ſilk-cotton trees, which, after all that had been taken off, to give it the ſhape of a veſſel fit for ſervice, was thirty foot about, and of at leaſt a proportionable length.

RELATION VIII.

A MERCHANT, rich and judicious, and more addicted to letters than is uſual to men of his calling, being returned into *England* from ſome of the remoter parts of the *Eaſt-Indies*, to ſatisfy my curioſity about a ſtrange tradition of ſeveral navigators about a more than one way extraordinary in-draught of the ſea on the coaſt of a great iſland of the ſouthern ocean, ſent me the enſuing relation, which, though it contains ſomething manifeſtly fabulous, but eaſily diſtinguiſhable from the reſt, I give you in the relator's own words, being unwilling to alter any thing, till I can ſee him again, and propoſe my ſcruples to him.

AT *Campar* and *Racan*, on the eaſt coaſt of *Sumatra*, is in the river's mouth (to a certain diſtance) at each new and full moon, a violent in-draught of the ſea (called Bunna) which approacheth with an hideous noiſe, and mountain high, ſo that whatſoever oppoſeth it, periſheth. Its approach is in three parts; the firſt high, but not ſo terrible; the ſecond is high, black and horrid; the third is low, and of gentle motion: before its approach, it giveth ſo fair warning, that the people may eat, and bathe themſelves, before they weigh anchor; but when they weigh, they muſt row hard againſt it, and when its fury is paſt, follow with it, till they return to their anchor place. The true reaſon whereof the inhabitants cannot diſcover: but (as if *Greece* only were not the mother of fabulous traditions) theſe poor natives fabulize, that at *Campar* (where is the greateſt Bunna) in former ages, there was a princeſs, who, to ſhun the rape of an inſolent *Caffree* ſlave, ran into the ſea's mouth; but the ſlave ſtill purſuing her, and after him the princeſs's little dog, all periſhed; and thus (by a new metamorphoſis) theſe three waves perpetuate their commemoration. That afterwards a bold fellow, hoping to divert this Bunna from *Campar* (by advice of ſome wizards) rowed up againſt that firſt part of the torrent, and filling a bottle of its water, which he immediately ſtoped up cloſe, he betook himſelf to *Rakan* (not far diſtant) and poured it out into that river's mouth, which brought the Bunna thither alſo, though it left not *Campar*; but that fellow ſuddenly after dying, none durſt ſince attempt the like, elſe the natives fancy it may ſtill be done.

MY humble opinion is (adds my relator) that the mouths of thoſe rivers being choaked up with their ſand-banks, and ſo rendered very ſhallow; when the great ſpring-tides come roaring over thoſe ſhoals (at the new and full-moons) out of the *Mallacca* ſtreights, the firſt influx is irreſiſtible by ſuch ſmall veſſels as uſe that port (eſpecially if attended with dark weather, or ſtormy guſts) ſo that they are forced to weigh and bear up againſt it, for fear of being ſtranded and ſplit. In which ſentiment I reſt, till I can attain a more prevalent reaſon.

RELATION IX.

A GENTLEMAN, that had travelled far, and obſerved much, related to me, that being off the coaſt of *Moſambique*, between the 20th and laſt days of September, the captain of the great Portugal ſhip they were in, walking to and fro upon the deck, ſpied, a great way off, a very little dark cloud, or blackiſh ſpot, in the ſky: whereupon, though the weather were fair, he made all the haſte he poſſibly could to provide for a great ſtorm, by taking in the ſails, *&c.* And though for a while the ſky continued clear, and they had no ſigns of an imminent change; but that, when the cloud approached, the wind, that had till then filled their ſails, ceaſed, and the ſea became calmer than before: but preſently after they had a furious hurricane, which turned their ſhip quite round many times one after another, as if it were an aerial whirl-pool, which laſted for above two hours, and then left them, ſeeming to have a progreſſive motion, as whirlpools in rivers often have.

RELATION X.

AN ingenious practitioner of phyſick, accompanied by one of the ſame profeſſion, aſ-

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ſured me with great aſſeveration, that ſome while ſince, being at a place in the country near *Amſterdam*, where there lived a kind of a farmer, who (though illiterate enough) was reputed very curious; this perſon ſhewed him, among other things, a conſiderable quantity of quickſilver, that was altogether of the colour of gold. And, to anſwer my ſcruple, this relator added, that the colour did not belong only to the ſurface of the whole maſs; but having purpoſely (with water) divided it into many globules, each of them retained the ſame rich colour. And he further told me, that the poſſeſſor of this yellow mercury having put ſome of it over a fire in a convenient veſſel, it quickly loſt its fluidity, and was precipitated into a red powder; about which he hoped to learn ſome notable things at his next viſit to the author: but that having been too long delayed, when he came to the place again, he found, to his great grief, that the maſter was dead, and his relations were, or pretended to be, ignorant of his ſecrets.

A VERY learned and experienced phyſician made me a viſit to give me notice, that a few days before he had received one in the night from a couple of ſtrangers, one of whom, by ſome things that he ſaw him do, he judged to be (what they call) an adeptus, who, beſides a thing far more rare and valuable, ſhewed him, as a curioſity, a running mercury of a lovely green. And when I aſked my judicious relator, whether he had broken the fluid maſs into drops, to obſerve, whether the colour were that only of the ſurface, or of the whole maſs? he anſwered, that he purpoſely laid it upon a rough body, as a carpet, and found the globules, whereinto it was by this means divided, to be of the ſame fine green, that had beautified the whole maſs.

THESE relations, though they had come to me from leſs credible perſons than thoſe I received them from, I ſhould not haſtily have rejected, becauſe of ſome odd and fine colorations of running mercury, that I have myſelf obſerved, but here forbear to mention, becauſe they belong to another paper.

THE

GENERAL HISTORY of the AIR

DESIGNED and BEGUN.

Advertiſement of the Publiſher to the READER.

THE deſign of the following papers the author's own preface will acquaint thee with. And though, as thou wilt there ſee, his expectation of aſſiſtance (in a work too great for one ſingle man's undertaking) from others failed him, yet I doubt not but his own experiments and collections would have made this treatiſe much larger, before it had been publiſhed, had his health allowed him opportunity: but that permitting him not ſo much as to review theſe papers, or range them into that order, which would be moſt advantageous, thou art not to wonder, if thou findeſt ſome defects, ſome diſlocations, and other faults in this publication, which the author's laſt hand would have prevented. The negligence of tranſcribers has let ſlip the characters of relators, and names and places of authors, from whom ſeveral of the particulars in the following papers were taken: nor could it be hoped that the author's own memory (were he in a ſtate of health fit to be troubled with it) ſhould, after ſo long a time as this collection has been making, and in that variety of men and books he has had to do with, be able to retrieve them. But this will be no great loſs to the learned world, which is ſufficiently acquainted with his great caution, and will make no difficulty confidently to rely upon his unaffected candor and ſincerity. I know not how much ſome other parts of his noble, and always buſy deſigns for the advancement of knowledge, and the benefit of mankind, may ſuffer by that tenderneſs of his conſtitution, which the importunity of his friends can hardly prevail upon him to withdraw from philoſophical cares. But this he has ordered ſo, that imperfect as it is, one cannot call it deficient; ſince the foundation being here laid, and the draught made, every one may, if he pleaſe, add towards the compleating of the building, I will not ſay with materials equal to what his ſagacity and laboratory uſed to afford; for we muſt not expect to find in every age a man able and ready to lay out ſo much coſt, pains and ſkill, frankly, for the improvement of natural philoſophy, and the information of the world, as he has done. The ſcheme of titles, under which theſe materials for the hiſtory of the air are ranged, is ſomewhat different from that printed by him ſeveral years ſince, and diſtributed amongſt his friends. But this is without any prejudice to the main deſign,

ſince whatſoever any one hath collected under thoſe heads, will be eaſily reducible to theſe, which in a more natural order are more comprehenſive. In that firſt draught he followed my lord *Bacon*'s advice, not to be over-curious or nice in making the firſt ſet of heads, but to take them as they occur. But now that thus much comes to be publiſhed, which perhaps may ſerve to ſome men as a common place for the hiſtory of the air, the titles have been a little more increaſed, or methodized, to which any one may add as he finds occaſion: only in theſe the reader is deſired to obſerve,

I. THAT under the title of mineral ſubſtances are comprehended earth, and all other foſſils, to avoid multiplying of articles.

II. THAT when any mixed body is ranked under animal, vegetable, or mineral ſubſtances, it is put under that of the three, which either it partakes moſt of, or to which moſt is owing in the preſent experiment, or which in its own nature it moſt reſembles.

III. THAT it is not by an over-ſight, that lightning is put under two different titles; for in one it is conſidered only in reference to the ſight; in the other it is conſidered as the product of ſulphureous or inflammable effluviums taking fire, with the ſtrange effects it produces; which may be an example of putting the ſame thing with different views, under different heads.

WHAT is above ſaid, was written whilſt the author was living, to which it is neceſſary now to add, that the titles, as here printed, and the order of the papers, as now ranged under them, were ſhewn to the author, and approved by him, as fitter for the general hiſtory of the air, than thoſe he had formerly printed. So that, reader, thou haſt theſe papers as they were prepared and ordered to be publiſhed in his life-time; and they had then gone to the preſs to be printed, juſt as thou now receiveſt them, had not the publiſher the laſt winter been haſtily called out of town.

The PREFACE.

THE continual uſe of the air is ſo abſolutely neceſſary to our life; the good or bad temperature of it is ſo important to our health; and the ſcarce evitable preſence and powerful preſſure of it, has ſo great an intereſt in many of the phænomena we meet with here below, and even in divers, where its agency is not ſuſpected; that among mere bodies there are perhaps few ſubjects, that more deſerve our curioſity, whether as we are animals, or as we are naturaliſts. Upon which account I can ſcarce think, that any thing, that conduces to the fuller knowledge of a body ſo diffuſed, ſo neceſſary, and ſo powerful, is fit to be deſpiſed, or is unworthy to be preſerved in writing.

AND therefore, though I have formerly had occaſion to treat, in diſtinct tracts, of ſome of the qualities or affections of the air, as its gravity, ſpringineſs, *&c.* yet I found myſelf inclined to contribute further to the knowledge of that vaſt and uſeful ſubject, by ſetting down ſome memorials, partly out of my own obſervations and trials, and partly out of thoſe I had from perſons of good credit, concerning ſome cauſes and effects of the changes of the air, and conſequently concerning ſeveral of its qualities, that were requiſite to be taken into conſideration in a work of that nature. And not content with this, though my own ſtudies and affairs would not permit me to proſecute myſelf the deſign I am going to mention, yet thinking it might be a very uſeful thing, in reference both to philoſophy and phyſick, that a natural hiſtory of the air (though at firſt it ſhould prove but a very imperfect one) were faithfully compiled, I propounded the deſign to ſome virtuoſi, that ſeemed to reliſh it, and undertook to be aſſiſtant in it.

AND to facilitate their work, I drew up a ſet of heads and inquiries of that ſort, which in another paper I call titles of the firſt claſſis or order; which, though purpoſely ſet down without any anxious method, were comprehenſive enough to have a good number and variety of particulars conveniently referred to them. But afterwards finding the perſons, to whom I had committed theſe ſchemes, to have been for many years very unmindful of their promiſes; I did on this diſcouragement lay aſide, not only the hopes of a general hiſtory of the air, but what I had already written about the changes of that body.

AND upon the ſame accounts, thoſe ſcattered notes lay many years in looſe neglected papers, till at length the curioſity and deſires of ſome virtuoſi, that knew I had gathered ſome remarks, though few and incoherent, touching ſome qualities of the air, obliged me to draw together thoſe, that without a troubleſom ſearch I could retrieve, offering themſelves to promote the deſign, that others had abandoned. The deſire to gratify theſe inquiſitive men, and the conviction I am brought under, by ſuch reaſons as are mentioned at the beginning of this paper, that ſcarce any truth, whether hiſtorical or doctrinal, that relates to ſo important a ſubject as the air, is unfit to be preſerved, prevailed with me, rather to chuſe a very diſadvantageous way of ſetting down what I have to deliver about it, than ſuffer the looſe obſervations I had occaſion to make about ſome phænomena and qualities, and eſpecially the changes of the air, to be loſt. And therefore, though I have not the leiſure to methodize

my incoherent notes, and much leſs to weave them into continued diſcourſes; yet rather than let them periſh, and diſappoint thoſe, that will have them ſuch as they are, I am content to refer to ſome of the titles prefixed to this treatiſe, as to a kind of common places, what my memory, or ſome old notes about divers things relating to the air, and eſpecially to the cauſes and effects of its changes, ſupply me with in reference to that body.

And upon the like account, I have not ſtrictly confined myſelf to the mention of my looſe obſervations, and thoſe that I have been furniſhed with by anſwers to the queſtions I put to divers travellers and navigators; but I have alſo caſt in ſeveral pertinent paſſages, that chanced to occur to me in the reading of ſome voyages, and other books, eſpecially ſuch as either are out of print, or are but in few hands, or elſe are not extant in thoſe that are called the learned languages. And that thoſe virtuoſi, that are willing to contribute their induſtry to carry on the deſign, that was at firſt propoſed, might have ſome heads whereunto to refer what ſhall occur to them; I thought fit to premiſe to my papers the abovementioned ſcheme, or rough draught of the general hiſtory, (which, after many years I chanced to recover.) I have alſo thought fit, that under three or four titles, my collections of particulars ſhould be ſomewhat large and methodical, to afford the ſame perſons ſome ſpecimens of what I ſhould have thought requiſite to do upon particular ſubjects, if I would have ventured upon ſuch a taſk, as to write a natural hiſtory of the air.

I am not ignorant, that I expoſe myſelf to cenſure, for ſuffering to paſs out of my hands memoirs ſo maimed and imperfect, that ſeveral of the ſubjects mentioned in the ſcheme of titles are left altogether untouched; and thoſe, that are particularly mentioned, are for the moſt part touched upon but lightly. But the chief, though not perhaps the only reaſons, that kept me from being ſilenced by theſe conſiderations, though I confeſs them to be weighty, were theſe: firſt, that not pretending to write the hiſtory of the air, but only ſome memoirs of it; I might, without incongruity or indecency, contribute what had occurred to me in reference to ſome of the titles, though I left the others to thoſe, that had made experiments or obſervations about them. Next, that having, through the fraud or negligence of ſome perſons, loſt ſundry looſe papers, that I had provided for the hiſtory of the air, my unwillingneſs, that the reſt ſhould undergo the ſame fate, invited me to impart them to many, as the beſt expedient to ſecure them. To which I, thirdly, add an inducement, which, though laſt named, was the firſt in efficacy, as that which made the other two ſignificant; namely, that I had more than once obſerved, that when a work of this nature has been once begun and taken notice of, in ſuch an inquiſitive and active age as this of ours, it ſeldom fails to excite the curioſity and induſtry of others, whom, if the deſign be any thing well laid, the utility, that it promiſes, will invite to carry it on.

THE

GENERAL HISTORY of the AIR

DESIGNED and BEGUN.

TITLE I.

What we underſtand by the air.

By the air I commonly underſtand, that thin, fluid, diaphanous, compreſſible and dilatable body, in which we breathe, and wherein we move, which envelops the earth on all ſides to a great height above the higheſt mountains; but yet is ſo different from the æther [or vacuum] in the intermundane or interplanetary ſpaces, that it refracts the rays of the moon and other remoter luminaries.

TITLE II.

Of the conſtant and permanent ingredients of the air.

A ſhort anſwer to a queſtion about the nature of the air, given by Mr. Boyle *to Mr.* H. Oldenburg.

As to your queſtion, what I think the air to be? I ſhall in the firſt place take it for granted, that by the air you mean not, either the pure element of air, which ſome, nor that etherial or celeſtial ſubſtance, that others (upon what grounds I muſt not here examine) aſſert; but that, which I am wont

to

to call the atmoſpherical air, which is that common air we breathe and move in.

But though I know you too well to ſuſpect, that you deſign any ambiguity in your queſtion; yet I ſhall not adventure to anſwer it, till I have premiſed a diſtinction that is not uſual: for, according to my thoughts, the air may be taken either for that, which is temporary, (if I may ſo call it,) or in a tranſient ſtate; or that which is laſting, and in a permanent ſtate. This diſtinction, which perhaps you looked not for, I ſhall illuſtrate by this example, that if you ſufficiently heat an æolipile furniſhed with water, and ſtay a pretty while to afford time for the expulſion of the aerial particles by the aqueous vapours, you may afterwards obſerve, that theſe laſt named will be driven out in multitudes, and with a noiſe, and will emulate a wind or ſtream of air, by blowing coals held at a convenient diſtance, like a pair of bellows, and by producing a ſharp and whiſtling ſound againſt the edge of a knife, held in a convenient poſture almoſt upon the orifice of the pipe, whence they iſſue out. But this vapid ſtream, though in theſe and ſome other things it imitates true air, whilſt the vehement agitation laſts, which the vapours it conſiſts of received from the fire; yet in a very ſhort time, eſpecially if the weather, or the veſſels it enters into, be cold, loſes the temporary form it ſeemed to have of air, and returns to water, as it was at firſt.

This premiſed, I come to ſpeak directly, but dare not do it confidently to your queſtion: for though poſſibly I may have made as many trials as another about the nature of the air; yet I freely confeſs to you, that I much ſuſpect there lies yet ſomething concealed in it, that needs a further diſcovery, which may perhaps be made by further trials. But in the mean time, (not wholly to baffle your curioſity, ſince it is ſo modeſt, as to deſire to know of me, not what the true nature of the air is, but what I gueſs concerning its chiefeſt property or attribute) I will acquaint you with ſome of the thoughts I long ago had, and which I yet took upon myſelf, and deſire to have them looked upon by you but as conjectures, entertained only till farther diſcoveries confirm them, or ſuggeſt better in their room.

It ſeems then not improbable to me, that our atmoſpherical air may conſiſt of three differing kinds of corpuſcles. The firſt is made of that numberleſs multitude and great variety of particles, which, under the form of vapours or dry exhalations, aſcend from the earth, water, minerals, vegetables, and animals, *&c.* and in a word, of whatever ſubſtances are elevated by the celeſtial or ſubterraneal heats, and made to diffuſe themſelves into the atmoſphere. The ſecond ſort of particles, that make the air, may be yet more ſubtile than the former, and conſiſt of ſuch exceeding minute parts, as make up the magnetical ſteams of our terreſtrial globe, and the innumerable particles, that the ſun and other ſtars, that ſeem to ſhine of themſelves, do either emit out of their own bodies, or by their preſſure thruſt againſt our eyes, and thereby produce what we call light; which, whether we explicate it by the Epicurean or Carteſian hypotheſis, argues a great plenty of a celeſtial, or ſome other very ſubtile matter, to be diſperſed through, or harboured in the intervals of the ſtabler or groſſer corpuſcles of the atmoſphere.

But becauſe you expect from me a diſtinguiſhing, and as it were, characteriſtick quality, which may put a difference between the parts already named of the atmoſphere, and thoſe, to which moſt of the phænomena of our engine, and many other pneumatical experiments ſeem to be due, I ſhall add a third ſort of atmoſpherical particles, compared with which, I have not yet found any, whereto the name of air does ſo deſervedly belong. And this ſort of particles are thoſe, which are not only for a while, by manifeſt outward agents, made elaſtical, but are permanently ſo, and on that account may be ſtiled perennial air.

Of the ſtructure of the elaſtical particles of the air, divers conceptions may be framed, according to the ſeveral contrivances men may deviſe to anſwer the phænomena: for one may think them to be like the ſprings of watches, coiled up, and ſtill endeavouring to fly abroad. One may alſo fancy a portion of air to be like a lock or parcel of curled hairs of wool; which being compreſſed by an external force, or their own weight, may have a continual endeavour to ſtretch themſelves out, and thruſt away the neighbouring particles, and whatever other bodies would hinder them to recover their former ſtate, or attain their full liberty. One may alſo fancy them like extremely ſlender wires, ſuch as thoſe of gold and ſilver, that tradeſmen unwind from ſome cylindrical bodies of differing ſizes, on which they were rolled; which pieces of ſpiral or curled wire may be, as of differing ſubſtances and conſiſtencies, ſo of very differing lengths and thickneſſes, and have their curls greater or leſſer, nearer each other, or more diſtant, and be otherwiſe diverſified, and yet all have ſpringineſs in them, and (notwithſtanding) be, by reaſon of their ſhape, readily expanſible on the ſcore of their native ſtructure, as alſo by heat, girations, and other motions, and compreſſible by an external force into a very little room. I remember too, that I have among other compariſons of this kind, repreſented the ſpringy particles of the air, like the very thin ſhavings of wood (that carpenters and joiners are wont to take off with their plainers; for beſides, that theſe may be made of differing woods, as oak, aſh, fir, *&c.* and thereby be diverſified as to their ſubſtance, they are uſually of very various breadths, and lengths, and thickneſſes. And perhaps you may the rather prefer this compariſon, becauſe it may ſeem ſomewhat to illuſtrate the production of the ſpringy particles of the air: for to make theſe ſhavings, there is no art nor curious inſtruments required; and their curls are no ways uniform, but many ways differing, and ſeemingly caſual; and, which is chiefly conſiderable,

ſiderable, theſe ſhavings are producible out of bodies, that did not appear, nor were ſuſpected to be elaſtical in their bulk, as beams and blocks, almoſt any of which may afford ſpringy ſhavings, barely by having ſome of its parts ſo taken off, as to be thin and flexible enough, and commodiouſly ſhaped; which may perhaps illuſtrate what I tried, that divers ſolid, and even mineral bodies, not ſuſpected of elaſticity, being put into corroſive menſtruums, devoid of that quality, there will, upon the convenient comminution of parts enſuing the action and re-action, that paſſes between them in the diſſolution, reſult or emerge a pretty quantity of permanently elaſtical fire. But poſſibly you will think, that theſe are but extravagant conjectures; and therefore without adding any thing in favour of them, I ſhall proceed, and willingly grant, that one may fancy ſeveral other ſhapes, (and perhaps fitter than theſe we have mentioned) for theſe ſpringy corpuſcles, about whoſe ſtructure I ſhall not now particularly diſcourſe, becauſe of the variety of probable conjectures, that I think may be propoſed concerning it. Only I ſhall here intimate, that though the elaſtical air ſeem to continue ſuch, rather upon the ſcore of its ſtructure, than any external agitation; yet heat, that is a kind of motion, may make the agitated particles ſtrive to recede further and further from the centres of their motions, and to beat off thoſe, that would hinder the freedom of their gyrations, and ſo very much add to the endeavour of ſuch air to expand itſelf. And I will allow you to ſuſpect, that there may be ſometimes mingled with the particles, that are ſpringy, upon the newly mentioned account, ſome others, that owe their elaſticity, not ſo much to their ſtructure, as their motion, which variouſly brandiſhing them and whirling them about, may make them beat off the neighbouring particles, and thereby promote an expanſive endeavour in the air, whereof they are parts. And though ſome of theſe may, in very cold climates and ſeaſons, prove to be of thoſe, which I not long ſince referred to temporary air; yet others of them may be ſo minute and agile, and ſo advantageouſly ſhaped, that, at leaſt in our climate, the air will ſcarce be ſo cold, but that the cauſes, which entertain the agitation, and keep it fluid, may alſo give a competent motion to particles ſo well diſpoſed to be kept in it.

And now, Sir, it will be time to endeavour to proceed to ſome particulars, that may countenance the conjectures I have hitherto been propoſing.

Having not now the leiſure to proſecute this diſcourſe uninterruptedly, till it be completely finiſhed, I thought it not unfit, not only to ſet down, in this paper, ſome of thoſe occurring thoughts and obſervations of my own, upon this ſubject, that were the likelieſt, unleſs this way preſerved, to vaniſh out of my memory, and which may ſerve to recal divers others into it; but alſo to annex ſome paſſages referable to the ſame purpoſes, borrowed from ſuch books, as probably I may not have at hand, when I ſhall reſume this treatiſe. Theſe two ſorts of paſſages make up the following notes, and are therefore to be looked upon but as materially here laid together to be preſerved, not ſo much for themſelves (though ſome of them perhaps deſerve not to periſh) as in order to the finiſhing of the deſigned ſtructure. And though, for that reaſon, they may often appear very confuſedly placed, yet they may ſeem more incoherent than they are, there being certain tranſitions, and other things, by which ſome of them may be ſo connected, as to be fit to make diſcourſive parts and paragraphs of the treatiſe they belong to; upon which account it is, that they are put at divers diſtances one from another, that if hereafter I have leiſure, there may be room for the tranſitions, *&c.* by which they are deſigned to be connected into coherent diſcourſes.

What is above ſaid, in reference to this tract in general, is applicable to thoſe particular parts of it, whether chapters or ſections, or other diviſions, that follow a line of aſtericks, ſuch as the enſuing * * * * * * * * * * * * * * * * * * * employed to ſeparate the unfiniſhed part of the diviſion it belongs to, from the foregoing.

TITLE III.

Of the æther in the atmoſphere.

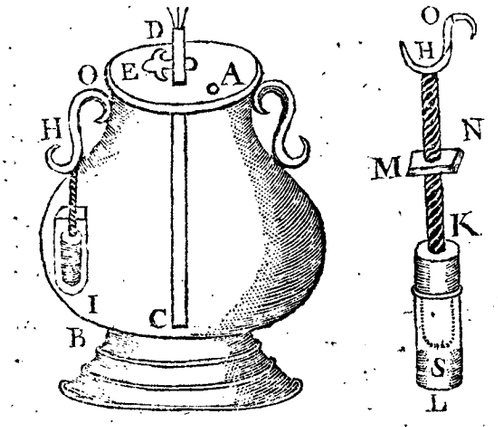
TITLE IV.

Of the ſpringy particles of the air, and the ſpring of the air.

Aerem validè comprimere, aut dilatare.

Follibus luſoriis aerem pyulco ingerentes majorem ſubinde atque majorem difficultatem percipiunt; quo enim magis aer concluſus à naturali raritate recedere cogitur, etiam majore niſu reſiſtit, neque ſolùm magis denſari renuit, ſed & ſe latiùs explicare molitur. Hinc didicimus & pneumaticos fontes conſtruere, qui ſpiritu interno urgente aquam in altum evibrant, & plumbeas glandes fiſtulis ejaculari, non pulvere nitrato ignem concipiente, ſed aere per vim denſato ad antiquas dimenſiones recuperandas erumpente. Quoniam verò ingeſta jam in conceptaculum non exigua aeris copia difficiliùs comprimitur novâ aeris acceſſione, quàm ut manus valeat truſillum rectâ impellere; idcirco truſilli haſtulam deformatam in helicem, & ſuæ matrici inſertam, adhibere operæ pretium erit: dum enim manubrio agitante contorquetur cochlea, ſenſim deprimitur embolus, aeremque ingerit. Ne autem morâ longiore opus ſit perpetuâ verſatione manubrii, ita cochleæ matrix externam vaſis faciem contingat, ut illi adnecti, atque ab eo disjungi valeat: initio enim, quando adhuc levis Caſati Mechanicorum, lib. VIII. c. 5. p. 792, 793, &c.

eſt aeris modicè compreſſi reſiſtentia, lamella illa ſuo foramine interiùs claviculatim ſtriato cohærens haſtulæ emboli, ſi à vaſe disjuncta fuerit, unà cum haſtulâ movebitur: deinde vero, quando jam truſillis ægrè impellitur, lamella illa cum vaſe connectatur, & non niſi verſato manubrio adduci atque reduci embolus poterit, id quod ſatis lentè perficietur. Rem claritatis gratia in fonte pneumatico explicemus.



Sit vas A. B. *ex materiâ metallicâ, in cujus ſuperiore parte labrum, ex quo per foramen* A. *immittatur in vas aqua, ita tamen, ut non impleatur; aqua enim in vas modicè inclinatum deſcendens, aerem expellet per tubulum* C. D. *ubi ſatis aquæ immiſſum fuerit, occludatur foramen* A. *diligentiſſimè cochleolâ congruente, & convoluto epiſtomio* E. *tubus* C. D. *ſit aeri impervius ad vaſis latus ſtatuatur modiolus cum embolo congruente* H. I. *& emboli haſtula ſit connexa cum mobili vaſi anſa* H. O.

Porrò haſtula H. K. *perforata ſit, & continuo ductu uſque ad emboli* K. S. *fundum pateat aeri ingredienti via* H. S. *ſed foramini* S. *adjecta ſit valvula, quæ aeri regreſſum obſtruat. Similiter modioli fundo in* I. *valvula exteriùs appoſita aperiatur ingeſto aeri tranſitum præbens; ſed aeri intra vas compreſſo cum nuſquam exitus pateat, valvula ipſa modioli foramen* I. *occludit. Haſtulæ verò* H. K. *exterior facies ſit in helicem ſtriata, & lamellæ* M. N. *tanquam matrici congruat, quæ in* M. *&* N. *cochleolis adnecti queat exteriùs vaſi, quaſi eſſet anſæ fulcrum.*

Ubi immiſſum fuerit quantum ſatis eſt aquæ, cochleolis M. *&* N. *revolutis disjungatur matrix à vaſe: tum attractâ anſâ* H. O. *unà cum lamellâ* M. N. *attrahitur embolus* K. S. *& per apertum ductum* H. S. *ingreditur aer, modiolum implens. Impulſo deinde embolo, valvula ad* S. *clauditur, & aer ex modiolo per patentem valvulam* I. *ingeritur in vas; ex quo nequit exire, neque aquam propellere, clauſo ſcilicet epiſtomio* E. *& foramine* A. *qua propter comprimitur, & denſatur; ideoque attracto denuo embolo* K. S. *incluſus vaſi aer ſe latius explicare connitens valvulam* I. *valide applicat foramini modioli, ſibique exitum obſtruit. Toties adducitur atque reducitur embolus, & aer ingeritur, quoad magna premendi difficultas percipiatur; ubi eò ventum fuerit, tunc lamella* M. N. *iterum vaſi adnectatur ſuis cochleolis; nec jam embolus rectâ adduci poteſt; ſed arreptum in* O. *manubrium verſatur, & embolus intrà modiolum circumactus ſenſim attollitur, qui deinde revoluto in contrarium manubrio deprimitur; & multâ vi aer in vaſe comprimitur. Laxato demum Epiſtomio* E. *compreſſus in vaſe aer aquam exprimit per tubum* C. D. *primùm quidem vehementius, ſubinde remiſſius, prout aeris vis elaſtica ſenſim longueſcit.*

Hoc idem quod de aere intra vas comprimendo ad aquam evibrandam comminiſci placuit, ſervatâ analogiâ, dicendum eſt de aere, tum conatu manûs rectâ truſillum impellentis, tum ope cochleæ ſimiliter conformatæ, intrà conceptaculum comprimendo, ut ex fiſtulâ deinde multâ vi emittatur plumbea glans, ubi reſeratus aeri exitus illum ſubitò dilatari permiſerit. Quin & pneumatica hujuſmodi tormenta citrà conceptaculum aeris compreſſi conſtruere non inutile accidat, ſi, quemadmodum noſtrates pueri ſurculos ſambuceos fungosâ medullâ exhauriunt, & utraque tubuli extremitate papyraceis globulis obſtructâ, alterum globulum congruo cylindro propellunt, atque incluſum aerem denſant, quoad aeris vim elaſticam & impellentis manus conatum non ferens extremus alter globulus edito ſcloppo expellatur; ita ferream fiſtulam longiorem paraveris, cujus alteri extremitati immittatur plumbea glans obducta papyro, aut ſimili materiâ, ut exquiſitè tubi oſculum implens demum univerſam aeris vim excipiat, alteram extremitatem aliquot ſpiris ambiat cava cochlea, quam impleat cylindrus ferreus in congruentem cochleam deformatus; ſi enim hujuſmodi cylindrus vix brevior fuerit, quàm fiſtula, & apto manubrio convolutus in fiſtulam ſenſim immittatur, totum aerem, quo fiſtula replebatur, ad exiguas ſpatii anguſtias adiget, ex quibus magnâ vi demum, quâ data porta, erumpens ejaculabitur plumbeum globulum.

TITLE V.

Of the magnetical particles in the air.

TITLE VI.

Of the deſtruction, generation, abſorption and extrication of the air.

New experiments about producing of air, and examining the bodies produced.

THAT the air has a great intereſt in the production of many phænomena of nature, either not formerly known, or not formerly aſcribed unto it, as the chief agent, if as any at all, has been, I ſuppoſe, ſufficiently manifeſted by our own experiments, as well as by thoſe publiſhed by abler writers.

THAT alſo the air is neceſſary not only to the well-being, but to the very being and motions of the generality of animals, will be eaſily deduced from thoſe trials, whereby we have made it appear, that animals, whoſe blood is hot, may be killed in our engine by the withdrawing of the air in about one mi-

nute of an hour; and that even thoſe minute creatures, whoſe blood or analogous juice is cold, will, for the moſt part, without excepting cheeſe-mites themſelves, preſently loſe all their viſible motions, upon the receſs of the air, may appear from our experiments about reſpiration.

WHEREFORE the air being a body ſo important in our ſpeculations of nature, and ſo neceſſary to the continuance of our lives, I could not but think it deſerved, that we ſhould ſolicitouſly enquire, whether it may or may not be produced by art: for if it can be ſo by any, not very uneaſily practicable ways, the diſcovery may not only help us to explicate ſome difficult phænomena of nature, but may afford us, among ſeveral other uſes, that of enabling us to ſupply divers, if not alſo ſubmarine navigators with freſh air produced under water, and thereby lengthen their ſtaying in places, where the continuance of it may be of great uſe, both ſpeculative and practical.

UPON theſe and the like motives, I reſolved, notwithſtanding the difficulties I foreſaw my curioſity would meet with in ſo new an attempt, to try what I could do. But before I relate the ſucceſs of this attempt, I muſt premiſe a couple of neceſſary advertiſements.

AND firſt, when I here ſpeak of production of air, I deſire to be underſtood in a familiar ſenſe, meaning, by that expreſſion, the obtaining a ſenſible quantity of air from bodies, wherein it did not appear, before they were handled after our way, that ſo much air, if any at all, was pre-exiſtent. This I ſay, becauſe I would not in this place needleſly ingage in the controverſy about the ingenerability (as they ſpeak) or the mutual tranſmutation of the bodies, that are called elementary: for though I am not ſure, but that ſome of our experiments may argue a new and real production of air, or a generation of it in the ſtricter ſenſe, yet I ſhall now employ the words generation and production, in the large and popular acceptation, and would ſignify by them, as I lately intimated, the obtaining of a ſenſible quantity of aerial ſubſtances from bodies, that did not appear to have it; whether this obtained ſubſtance were due to an extrication and union of aerial particles latent in the pores of the bodies, that afford it, or to a real production or generation of air, no where exiſtent antecedently to our experiments. And this is the firſt of my two advertiſements.

THE ſecond is this, that among the difficulties I foreſaw, in making experiments ſuited to my deſign, I looked upon it as one of the greateſt, though the leaſt obvious, that to ſatisfy ſuch a diſpoſition as mine, that is naturally prone enough to queſtion things, it would be requiſite for me to conſider, and, if I could, to determine, by appropriated trials, whether the fluid ſubſtances my experiments might afford me, deſerved the name of air or not. Wherefore I ſaw myſelf obliged to increaſe my taſk, and ſo direct my enquiries, that in the firſt place they may afford me ſenſible portions of ſuch a ſubſtance, as in a popular ſenſe may be ſtiled air, whether theſe obtained ſubſtances ought to be looked upon as true air or no. So that my intended diſquiſition would naturally conſiſt of two parts, whereof the former was to contain the ways of producing that, which ſeems air; and the other to propound thoſe of examining, how far the produced ſubſtance is endowed with the qualities, that are judged to belong to air as ſuch.

BUT in regard, that I thought it moſt convenient ſo to contrive my experiments, as to make ſuch of them as I could to ſerve me, both to produce air, and to examine it, I ſhall be more than once obliged to mingle the two parts of my diſquiſition, and reſerve for the latter of them only thoſe few trials, that concern purely the examen of the produced air.

AND upon this ſcore it will be ſeaſonable to take notice in this place, that foraſmuch as there are divers qualities aſcribed to air, which to me ſeem but accidental, and not univerſally to belong to air as ſuch; I have not obſerved any one attribute, that I think to be ſo much the property of air, and ſo fit to diſtinguiſh its true particles from aqueous vapours, earthy exhalations, and the effluvia of other bodies, as a durable elaſticity or ſpringineſs. And therefore I ſhall henceforth employ that as the chief criterion, whereby to conſtitute a portion of matter aerial, and diſcriminate it from other flying and fluid ſubſtances, and conſequently to allow or deny it the title of air.

NOW among the ſeveral ways I thought of, whereby to produce air, thoſe I judged fitteſt to put in practice were theſe. 1. By fermentation. 2. By corroſions and diſſolutions of bodies. 3. By boiling of water and other liquors. 4. By the mutual actions of ſome, eſpecially ſaline bodies, upon one another. 5. By the analyſes and reſolutions of certain ſubſtances.

EXPERIMENT I.

ON *January* 17 we conveyed into a long and large tube ſome filings of ſteel, and as much water as was thought convenient to dilute the oil of vitriol, which we alſo conveyed in a peculiarly ſhaped glaſs, ſealed at both ends, but with a hole opened near one of them; the external tube, and the water in them being exhauſted, and the mercury in the gage, which we had alſo included, being ſo far impelled up into the open leg, that there was ſcarce any at all left in the ſealed leg: this, I ſay, being done, the external tube was by our way exactly cloſed; and then the oil of vitriol being by little and little, and at good intervals of time, poured out of the internal tube, to actuate the water, there were produced exceeding large bubbles by the action of the ſolvent upon the metal, which alſo produced a ſenſible heat, though not a great one. When this conflict had laſted a while, we obſerved, in compliance with the chief ſcope of this experiment, whether

ther there would be any ſpringy air produced by all thoſe bubbles; and we perceived, that there ſeemed to be ſo much of it generated, that at length the mercury in the gage was impelled to the very bottom of the open leg, and the air included in the other ſeemed to be more compreſſed than it had been, when it was put in by the weight of the atmoſphere. But to try, whether this ſpring (wherein the warmth formerly mentioned might be ſuſpected to have for that time ſome intereſt) would continue, I removed the tube into another room, where was no chimney; and coming to look on it the next day, did not take notice of any ſenſible alteration in the gage; and with the like ſucceſs I viſited it for three or four days. But then coming one day to look upon it, I found the mercury in the gage to have aſcended about an inch and an half, and about that quantity of water to have got into the ſealed leg; which inclined me ſo much the more to ſuſpect, that this change in the gage might have been accidental, a boy having unknown to me removed the tube from its wonted ſtation, to place ſomewhat elſe there, without doing it heedfully enough. And this conjecture ſeems the more likely, becauſe I have not ſeen any notable change to have happened in the gage from that to this, (which is the 25th of *January* at night) the mercury in the open leg being about one inch and an half.

EXPERIMENT II.

MARCH 8. A glaſs vial holding about a pint (by gueſs) was filled with wheat flower, and as much water as was ſufficient to drench it well. Afterwards the orifice was exactly and ſtrongly cloſed with a cork, and an excellent cement: the glaſs was ſet in a warm place of the laboratory, becauſe of the coldneſs of the ſeaſon; and having ſtood there a fortnight bating one day, it this morning broke by the mere dilatation of the included matter, whoſe viſible part was laſt night obſerved to leave a conſiderable part unfilled beneath the cork. Notice was taken by the laborant of the event of this trial by a noiſe, which was no louder than one made upon the burſting of the glaſs into ſeveral pieces. To my taſte the included matter was but a little ſouriſh, but another afterwards judged it to be manifeſtly acid.

EXPERIMENT III.

MARCH 9. Having on the 23d of *February* put into a pretty large bolt-head a convenient quantity of bruiſed raiſins, with as much water as I thought neceſſary to make them ferment; and having cauſed the air to be carefully pumped out, and taken ſufficient order to keep any from forcing or ſtealing into the glaſs, I ſet it in the laboratory, that the warmth of the air might facilitate the fermentation. At the end of four or five days, it did not appear by a mercurial gage, (which had been purpoſely incloſed together with the raiſins) that there was generated any ſpringy ſubſtance. But being hindred by ſeveral occaſions from looking after this glaſs from time to time, it ſeems the contained liquor fermented more violently than the time of the year would have made one expect: for about four of the clock in the afternoon, no body being in the laboratory, the glaſs flew in pieces with a loud noiſe like the report of a piſtol; which alarming a domeſtick of mine, that was in a chamber not far off, made him haſten to the laboratory, where he found the raiſins thrown all about, and the middle part of the bolt-head (for the bottom and the pipe were intire enough) ſcattered into ſuch little pieces, that they ſeemed almoſt to be vaniſhed.

EXPERIMENT IV.

ON the 22d of *February* I filled a glaſs, that had a ſomewhat wide mouth, and might hold by eſtimation three pints (or pounds) of water; to which that liquor, and a convenient quantity of bruiſed raiſins upon the orifice of the glaſs, were tied to the neck of a pretty large bladder, out of which the air having been diligently expreſſed, it was ſtrongly faſtned to our glaſs with one of our cloſe cements; ſo that by ſqueezing the bladder, we could not perceive, that any air could get in or out. Then, this done, we left the glaſs in a convenient place in the laboratory, till the 8th or 9th of *March*; and then finding the bladder to be pumped up, we would have tied up the contained air, but could not do it by reaſon of an imperceived hole, perchance made with the point of a pin, by ſome one of them that handled it. Wherefore taking off this bladder, we cauſed another, that was very limber, to be put on after the manner newly deſcribed; and yeſterday morning we found it, though by eſtimation it might hold about two pounds of water, to be ſo full of air, that we could not without difficulty, and loſing a pretty deal of the contained air, tie the bladder very cloſe near the neck of it.

AND to try, whether this ſame mixture would continue to produce air, (whether fermented or not, I muſt not here diſpute) I cauſed another bladder to be faſtned to the ſame glaſs as before, and found it this morning, *March* 11, as full as if it were diſtended with a pair of bellows.

EXPERIMENT V.

APRIL 28. Into the bottom of a wide-mouthed vial we put ſome good ſpirit of ſalt, and filings of ſteel, and whelmed over it a R^r. fitted with an eel-ſkin and a wire, to the latter end of which was tied a thin glaſs-veſſel, hermetically ſealed at the bottom, though it was but ſlender, and furniſhed with a competent quantity of filings of copper: then we exhauſted the R^r. well with our engine, and afterwards thruſting the glaſs, that held the filings, againſt the bottom of the vial, we broke

broke it off, upon which the filings fell into the menſtruum, which acting upon them, there enſued good ſtore of bubbles, that made a froth much deeper than was the liquor, and the ſucceſſive generation of theſe bubbles continued a good while, and appeared ſome of them large enough, though in the free air they would ſcarce have been viſible, or at leaſt would not have been taken notice of, the vial having been kept in our vacuum for a quarter of an hour longer, and no greenneſs to be ſeen in the liquor, the R^r. was taken off, and the vial left open to the air.

EXPERIMENT VI.

A BUBBLE of air, whoſe diameter was near in length to that of a middle ſized pea, was left at the top of a round vial with a long narrow neck, whoſe cavity was filled with fine oil of turpentine, and then being inverted into a vial filled with the ſame liquor, was ſet aſide in a quiet place, and left there for a competent time. Another vial ſhaped like the former, but a pretty deal leſs, was filled neck and all with alcohol of wine, ſave a bubble of air about the ſame bigneſs with the former: this vial being inverted into another furniſhed with the ſame liquor, was ſet aſide in the ſame window with it, and at the ſame time: the event was, that about the end of the 6th day, the bubble diſappeared in the glaſs, that contained the oil of turpentine. And the like abſorption, if I may ſo call it, I obſerved to have been made of the air by the contiguous ſpirit of wine the next day after.

EXPERIMENT VII.

MAY the 23d. We opened another exhauſted receiver, wherein was an unſtopped vial more than half full of an opacous and blackiſh liquor, which we gueſſed (for we found no inſcription belonging to it) to have been frog's ſpawn, and were ſure to have been included at leaſt three years: by the mercurial gage, that was put up with it, it appeared to have afforded ſome air, but not very much. Its ſmell was ſtinking, much like that of the pump of a ſhip, but yet it had produced no inſects, nor had any appearance of mouldineſs.

EXPERIMENT VIII.

A GENTLEMAN of my acquaintance, an induſtrious digger for mines, and owner of a good one, informs me, that when the miners meet with running water under ground, they are thereby ſupplied with air enough for free reſpiration: and when I aſked, whether he thought, that air was produced or extricated by the motion of the water, or elſe were only concomitant to the ſtream? he anſwered, that it ſeemed to him more like to proceed from the water itſelf: and further anſwered me, that ſtanding waters did not afford air to the diggers; and that running waters did it even at conſiderable depths, amounting to many fathoms.

Experiments about the production of air, and the examining thereof propoſed.

SECTION I.

TO produce air by fermentation in exactly cloſed receivers.

To produce air by fermentation in ſealed glaſſes.

To ſeparate air from liquors by boiling.

To ſeparate air from liquors by the engine.

To produce air by corroſion, eſpecially with ſp. aceti.

To ſeparate air by animal and ſulphureous ſolvents.

To obtain air in the exhauſted receiver by burning glaſſes, and red hot irons.

To produce air out of gun-powder, and other nitrous bodies.

SECTION II.

EXAMINE the produced aerial ſubſtance by its preſerving or reviving, 1ſt, Animals. 2dly, Flame. 3dly, Fire. 4thly, The light of rotton wood, fiſh.

To examine it by its elaſticity, and the duration thereof.

As alſo by its weight.

AND by its lifting up the ſmoke of liquors.

TITLE VII.

Of the accidental or leſs conſtant ingredients of air.

TITLE VIII.

Of aqueous particles in the air, and of the moiſture and drineſs of the air.

I SHALL not here determine, whether in all the inſtances, that are referred to this title, the phænomena be produced by the mere moiſture of the air as ſuch, or by ſome other agents, whoſe corpuſcles are accompanied and aſſiſted by the moiſt air as a vehicle and a concurrent cauſe. But without nicely diſtinguiſhing the grounds of particular operations, we ſhall refer the phænomena in general to the moiſture of the air, (or moiſt air) that quality being the moſt obvious to be obſerved in theſe phænomena; in the production of ſome of which it ſeems either the only, or the main cauſe, in others an aſſiſtant cauſe, and in all a not uſeleſs concomitant.

THE account, upon which a body is dry, being uſually but this, that the pores inter-

cepted between its more ſtable parts are not filled with any viſible liquor, it is not to be expected, that a quality, ſo near of kin to a privation, ſhould furniſh much to our preſent hiſtorical notes: but yet drineſs may ſometimes have a not inconſiderable intereſt in the changes of a body, and that upon differing ſcores, whereof I take theſe two to be the chief. Firſt, as the body by exſiccation is deprived of thoſe liquid and exhalable parts, that were before harboured in its pores, and were perhaps the principle of divers operations aſcribed to it. And ſecondly, as theſe evaporable parts by their receſs may occaſion a change of texture in the body, eſpecially in regard of the pores, whoſe bigneſs, figure, and perhaps poſition being altered, the body by this change of texture acquires a diſpoſition to act, and be acted on in ſeveral caſes, otherwiſe than formerly.

A tranſcript of an obſervation made at *Stanton*.

SOMETIMES when the weather began to be overcaſt, the hygroſcope did not ſenſibly appear to grow heavier; and ſometimes it would preponderate, when I took notice of no vapours to make it do ſo: and though theſe things happened but ſeldom in reſpect of the ordinary changes of the hygroſcope according to thoſe of the weather; yet they made me ſuſpect, that ſometimes the clouds may conſiſt of other ſteams than aqueous, or that there may be ſome exhalations, that may have a peculiar congruity with the pores of the hygroſcope, and whoſe nature may be ſuch as to the power of drying the hygroſcope, that upon theſe or ſome other yet unheeded accounts, the ſteams, that are ſometimes diffuſed in the air, may controul the uſual and regular cauſes of increaſing or leſſening the gravity of the hygroſcope. And this ſuſpicion was the ſtronger, becauſe having made hygroſcopes with powder and ſalt, and alſo with the ſaw-duſt of wainſcot, hung at nice ſcales in very thin open glaſſes, purpoſely blown for lightneſs ſake at the flame of a lamp, though they uſually acquired and loſt weight, as the weather grew moiſter or drier, yet ſometimes they did not.

EXPERIMENT I.

AT half an hour after nine o'clock at night, I looked upon the half hundred weight, that hung at the bottom of the rope, the weather being then fair; and a mark being put at that part of the erected board, where the bottom of the weight touched, I perceived the ſky a while after to grow cloudy and overcaſt, but without rain: wherefore going to viſit the weight again, I found it to be riſen $\frac{1}{4}$ of an inch or more; and looking on my watch, perceived there had paſſed an hour and a quarter ſince the mark was made.

THIS morning I came again to look upon the weight between eight and nine of the clock, and found it raiſed above the newly mentioned mark, made laſt night, about one inch (for it was about $\frac{9}{10}$ths of an inch.) This day, the weather being fair and windy, the weight was fallen by ten at night about ſix inches beneath its ſtation, at which I found it when I looked on it in the morning.

BEING not well yeſter-night, the weight was obſerved at bed-time by two of my ſervants, and it then reſted at the 11th of the erected bound. This morning, about eight of the clock, I viſited it my ſelf, and found it to be riſen about $\frac{1}{8}$ of an inch above the eighth inch, the morning being cloudy, though the morning very dry and duſty. The weather growing more overcaſt, within ſomewhat leſs than an hour after, I viſited the weight again, ſome ſcattered drops of rain then beginning to fall, and found it to be riſen about half an inch above the newly mentioned eighth mark.

I LOOKED, when I was ready to go to bed, upon the ſuſpended weight of 56 pound, and marked how low it reached upon the divided board; and a great part of the night having been rainy; I looked again, when I was dreſſed in the morning, which was about half an hour after eight a clock, and I found the cord ſo ſhrunk, that the weight was raiſed above five inches higher than I left it the night before; but the day recovering dry and windy, and ſometimes warm, the rope was ſo ſtretched, that at night the weight ſunk a good way beneath all the marks. *N. B.* The rope near the weight was in diameter $\frac{3}{16}$ of an inch, and four decimal parts of a tenth.

EXPERIMENT II.

We took a rope of near three foot and an half in length from the point of appenſion, and ſomewhat leſs than $\frac{3}{16}$ (inch) in diameter: this we ſuffered to be ſtretched for ſome days by a weight of lead with an iron ring or anſula, weighing a quarter of an hundred, according to the great hundred, which is five ſcore and twelve: and then placing a flat board under it, ſo that the weight juſt reſted upon it, we had the rope well wetted over them with a ſponge dipped in water, and ſo often applied to it, that the liquor might be thoroughly ſoaked into the pores of the rope, which at firſt ſeemed thereby a little ſtretched, rather than ſhortened; but after an hour or two it began to ſhrink, ſo that we could make the weight ſwing like a pendulum over the piece of board it leaned upon before. But afterwards the ſame day the weight ſtretched out the rope again as much as formerly.

IT is obſervable, that though *Morocco* be an inland-town, and the ſoil of thoſe parts be uſually dry, if not parched; yet doctor *D.* who was lately there, informed me, that about *Morocco*, notwithſtanding the violent heats he felt in the day-time, he obſerved the nocturnal air to be very damp, ſo as to make the clothes he put off at night exceeding moiſt, and unfit to be worn, without airing the next morning. He added, that though the air was very piercing, and manifeſted itſelf to be ſo by many other ſigns, yet it would not make his knife ruſt in his pocket, or his ſword in the ſcabbard, though it would quickly produce a ruſt in inſtruments of that metal expoſed naked to it.

Air too moiſt cannot be wholeſom. The air in our parts, *viz.* about *Oakly* in *Buckinghamſhire*, though a high country, is, as I ſaid before, between *Michaelmas* and *Alhallontide* very moiſt, eſpecially in rainy weather, and upon a thaw, inſomuch that wainſcots, ſtair-caſes and pictures will ſtand all of a water, and after run down in great drops; and at *Brill*, upon that high hill, it is in divers houſes worſe than in the valley, inſomuch that the ſtair-caſes, eſpecially if laid in oil, will run down with water: the north and north-eaſt ſide of our houſes are obſerved to be moiſter, inſomuch that the furniture will rot, if fires be not made ſometimes in the rooms, and the things aired: this is obſerved to be the moſt aguiſh ſeaſon of the year. Mr. *J. T.*

As in another experiment we tried, whether or no the removal of the air out of the receiver would much alter the temperature of the included medium or ſpace, as to heat and cold; ſo we endeavoured to diſcover, whether the alteration would be notable, as to drineſs and moiſture. To this purpoſe we did indeed wiſh for ſuch a hygroſcope (or inſtrument wherewith to meaſure the moiſture and drineſs of the air) as we uſed, many years ago, and ſince found well deſcribed by the induſtrious *Kircher*, in a place of his *ars magnetica*, to which I therefore refer your lordſhip. But in regard that to this inſtrument there is requiſite the bread of a wild oat ſeaſonably gathered, which we could not then procure; we recalled to mind another hygroſcope, which, though it diſcover not ſuch ſmall mutations as the former, we thought might be uſefully enough ſubſtituted inſtead of it.

Of this hygroſcrope, having particularly deſcribed it in another paper, we ſhall now only ſay in a word, that it is made by faſtning to the upper end of a piece of gut-ſtring, or great luteſtring, a very light index, and ſtrongly faſtning the lower end of the ſame ſtring to the bottom of a box, or other convenient frame, the circumference of whoſe upper part may be at pleaſure divided into degrees or other partitions, upon which the index may move to and fro. For the inſtrument being thus made, when the air grows moiſter, the vapours inſinuating themſelves into the pores of the filaments, that compoſe the ſtring, do ſomewhat ſhorten it; and thereby thoſe filaments being altered in point of contortion, the index that is faſtened to them turns one way; and, upon the receſs of thoſe vapours, or of others of like nature, the ſtring comes to be wreathed, and conſequently the index to be moved another way. So that, in a ſtring of about three inches long, the point of the index will be oftentimes made to change its place very notably, by ſuch a mutation of the air, as to drineſs and moiſture, as was to be met with in the morning and at noon of the ſame day, though ſuch a change did not always need either rain, clouds or miſts, or the abſence of them, to make it notable.

EXPERIMENT III.

We took then one of theſe hygroſcopes, and conveyed it into a ſmall receiver, that the removal of the air being ſudden, the change of temperature (if any ſhould happen) in the exhauſted cavity, might be the more ſudden and conſpicuous. But we found not that the emptying of the receiver made the index ſenſibly change place. And though this experiment were carefully made, yet for the greater ſecurity we repeated it once more; and neither then perceiving the index to remove, we kept the receiver exhauſted for a pretty while, leſt there ſhould be ſome more time requiſite to the operation of the medium upon the inſtrument. But neither did this trial produce any ſenſible alteration of the index; but after the key was turned, and acceſs was thereby given to the excluded air, though the cover were ſtill kept on, we found, that then within ſome hours, the index was conſiderably removed. So that as far as theſe experiments informed us, the ether or ſubtile matter, that ſucceeds in the place deſerted by the air, if that place be not left void, and conſequently the thinner and more fluid part of the atmoſphere (in which the corpuſcles, that may be more properly called aerial, ſwim) ſeems in its own nature to be very ſenſibly, neither cold, or hot, or dry, or moiſt. I ſaid, as far as theſe experiments; I mean thoſe we made in this engine with the thermoſcope and hygroſcope, inform us; becauſe this conjecture (for I dare yet call it no more) may be examined divers other ways, whoſe events may either confirm, or oppoſe, or limit it. In the mean time I could wiſh, that if your lordſhip had one of *Kircher*'s hygroſcopes at hand, you would frequently and carefully try the laſt recited experiment with it; becauſe I have found, that if ſuch a hygroſcope be very well made, it is admirable, as well as pleaſant, to ſee how ſmall a mutation of the neighbouring air it will take notice of. But I thought fit to deſire to have it frequently tried, becauſe care muſt be taken, that ſuch motions of the index be not miſtaken for the effects of the altered temper of the medium in the receiver, which may in ſome caſes proceed from thoſe ſteams of the oil and water, which we elſewhere mention, that we now and then, though but ſeldom, obſerved to get out of the cylinder into the receiver, and play up and down there.

TITLE IX.

Of clouds, miſts and fogs.

Hearing that an excellent aſtronomer of my acquaintance had often meaſured the height of clouds, I enquired of him what height he obſerved them to have? and was anſwered, that though he had meaſured eighteen or twenty even of white clouds in fair weather, yet he obſerved ſcarce any one to be higher than three quarters of a mile, and few of them he found to exceed half a mile.

A miſt coming, driving upon the ſea towards the ſhore, though without any ſenſible wind,

wind, will riſe a greater ſwell of a ſea, than a briſk wind will do. *N.*

I HAVE obſerved in a ground near my houſe, which is ſomewhat moiſt in winter, as alſo in other places, eſpecially after a warm day, and againſt fair weather in autumn, a moiſt bluiſh miſt to aſcend about twenty or thirty foot high, and then to ſubſide again in dew. Mr. *J. T.*

TITLE X.

Of terreſtrial ſteams in the air.

ENquiring of an ingenious acquaintance of mine, who, in an incloſed ſcope of ground, has ſeveral veins of differing metals and minerals, whether he did not ſee, and ſometimes ſmell ſteams aſcending out of this or that ſpot of his ground, in circumſtances where their aſcenſion could not be imputed to the action of the ſun? he and his ſon, who was alſo a virtuoſo, told me, that they had divers times ſeen as it were pillars of fumes aſcending like ſmoke, whereof ſome would be inodorous, ſome ill-ſcented, and ſome, though but ſeldom, well-ſcented. And you may have obſerved, as well as I, that fogs, ſome of which I have known to be very laſting, and to have a large ſpread, did require no tender noſtrils to perceive them to ſtink.

I HAVE frequently obſerved the ſmoking ſteams, that aroſe out of the ſhafts of mines not wrought in: and it is certain, the charcoal made in *Cornwal* (eſpecially of that wood, that grows in the mineral part thereof) doth afford a manifeſt arſenical and ſulphureous ſmell beyond other charcoal. *N.*

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Tel eſt par exemple ce nuage horrible d'une fumée epaiſſe, qui s'eleva de la mer de Crete au commencement de l'eſte de l'an 721. & qui s'etant repandu dans l'air le fit paroiſtre tout en feu. La mer n'en fut pas meſme exempte; car les groſſes maſſes de pierres enflammées qu'on en vit ſortir, & qui ſe joignirent a l'iſle qu'on nomme Hiera, échauferent ſi fort les eaux, qu'elles en bruloient les mains.

TITLE XI.

Of ſalts in the air.

IT is ſufficiently known, that the peripatetick ſchools teach the air to be an element warm and moiſt; and if it be an element, it ought, according to their principles, and thoſe of the greateſt part of other naturaliſts, to be a ſimple and homogeneous body. But becauſe ſuch an elementary or uniform purity is much eaſier to be found in the writings of ſchoolmen, than amongſt the works of nature, many of the modern philoſophers have juſtly forſaken this doctrine of the elementary ſimplicity of the air in ſome meaſure; but perhaps very few of them, if any, have aſſerted the air to be ſo exceedingly compounded a body, as in my opinion it really is. For divers of them grant indeed, that the atmoſphere is not abſolutely pure, but yet think, that it differs but gradually from true and ſimple air, as water a little moved and troubled does from clear and ſettled water. But for my part, I confeſs I acquieſce not in either of thoſe notions of the air. For, as I have elſewhere more fully declared in a ſhort diſcourſe, purpoſely treating of the ſubſtance of the air, although I will not deny, that there is an ethereal matter more ſubtile than the common air, which ether I take to be diffuſed through all the interſtellar part of the univerſe known to us, reaching to and ſurrounding all its great globules; yet, ſpeaking of the air, which we men live and breathe in, I take our atmoſſpere to conſiſt not only of the purer ether, but in great part of a vaſt multitude of effluvia emitted by the terraqueous globe, and the various bodies it is made up of, and perhaps in ſome parts alſo of ſubſtantial emanations from the celeſtial bodies; and that that, whereby the atmoſphere differs from ſuch pure air, as the ſchools tell us of, is not a bare and indeterminate feculency, but a confuſed aggregate of ſeveral diſtinct and perhaps diſagreeing kinds of effluvia. And amongſt thoſe, one of the principal ſorts I take to be the ſaline ones, which rove up and down amongſt others in that vaſt ocean of effluxions, we call the atmoſphere: wherein yet I do not think there are to be met with, either all ſorts of them every where, or perhaps any ſort in like plenty, in all places, and at all ſeaſons.

To ſhew, that the air is not unfurniſhed with parts of a ſaline nature, I might alledge ſome conſiderations, that ſeem to make it probable *à priori*, as they ſpeak, that there are always ſome ſuch corpuſcles emitted into the air. But, inſtead of inſiſting on ſuch particulars, becauſe they may ſeem too little of an hiſtorical nature, to be fit for this paper, I ſhall content myſelf to take notice in the general, that almoſt (if not more than almoſt) all the arguments I have employed, to prove the copious aſcenſion of ſubterraneal ſteams into the air, may be applied to our preſent purpoſe, ſince, amongſt the effluviating ſubſtances of the terraqueous globe, there are, as I have declared in another paper, huge quantities of common or marine ſalt, beſides nitrous, aluminous, vitriolate, and perhaps other kinds of ſalts. To which I ſhall add, that the emiſſion of ſubterraneal aporrheas or effluxes, is not the only means, whereby the air may be impregnated with ſaline particles; ſince the exhalations and vapours produced by the action of the ſun-beams upon the more ſuperficial parts of the earth and ſea may ſupply the air with ſwarms of corpuſcles, as well of ſaline, as of any other nature. Not to mention, that the number of theſe may, in divers places, be much increaſed by thoſe vulcanos, that have opened vents to diſcharge their fumes into the air; by thoſe numerous fires, which, burning in our chimnies, produce much ſaline ſmoak; and by other ways, which I ſhall here forbear to diſcourſe of, for the reaſon lately given for my declining

arguments drawn *à priori*; though some things applicable to this purpose will in likelihood occur amongst the instances I am about to add, to make it seem probable *à posteriori*, or by some effects and phænomena, that the air is impregnated with saline corpuscles, that are none of its least active parts, and may have great interest in divers of its operations.

FROM what has been hitherto delivered, to make it probable, that there is a saline substance in the air, I thought fit to proceed to other inquiries. The first; whether the aerial salts be of differing kind? and if so, which they are? and the second, how it comes by its saline substance? But about such differing points I durst promise my self but little satisfaction, and therefore shall not pretend to give you much.

AND yet, to say something to the first of the two enquiries, I am prone to think, that the saline particles of the atmosphere are not all of one sort, but that there may be three or four differing kinds of aerial salts.

I KNOW, that divers learned men, some physicians, some chemists, and some also philosophers, speak much of a volatile nitre, that abounds in the air, as if that were the only salt wherewith it is impregnated. But though I agree with them, in thinking, that the air is in many places impregnated with corpuscles of a nitrous nature; yet I confess I have not been hitherto convinced of all that is wont to be delivered about the plenty and quality of the nitre in the air: for I have not found, that those, that build so much upon this volatile nitre, have made out by any competent experiment, that there is such a volatile nitre abounding in the air. For having often dealt with salt-petre in the fire, I do not find it easy to be raised by a gentle heat; and when by a stronger fire we distil it in close vessels, it is plain, that what the chemists call spirit of nitre, has quite differing properties from crude nitre, and from those that are ascribed to the volatile nitre of the air; these spirits being so far from being refreshing to the nature of animals, that they are exceeding corrosive: And even when I caused earth to be dug up in an old pigeon-house, because that is accounted the most nitrous sort of earth, and distilled it with moderate fires, I did not find the volatile saline parts, that came over, to be like that, which these learned men conceive the air to be stored with. Nor have I met with among them any positive proof, to evince the truth of their opinion; which yet, as I was saying, I am content to admit, as an ingenious supposition, until something be offered, that shall prove it to be more; which I think not impossible to happen, at least as to some times and places. But I am not yet sure, that the exhalations, that ascend from the subterraneal parts, and perhaps also the sun-beams themselves, may volatilize many of the nitrous corpuscles they chance to act upon, and elevate them into the air, without analyzing them, or destroying their texture, as our fires are wont to do. But however, I do not take the hitherto mentioned nitre to be the only salt, that impregnates the air: for when I consider, how vast a portion of the terraqueous globe is covered with the salt sea, and how vast quantities of fossile salt, as well fine and clear, as coarse, are dug up in *Poland*, especially near *Cracovia*, in *Hungary*, *Transylvania*, and in divers other parts of the earth; when I consider too, that we seldom find salt-petre in the earth, but that there is sea-salt mixed with it, which puts the salt-petre-men to a great deal of trouble to separate it; and that even from salt-petre, that passes for good, I had trouble enough, when I had the curiosity purposely to refine it, to free the purely nitrous from the other saline particles; I am prone to suspect, that in very many places, especially maritime ones, the effluvia of common salt do, at least as plentifully as those of salt-petre, abound in, or impregnate the air: which conjecture might be favoured by divers things, if I had leisure to insist on them.

THAT in some places, that abound with marchasites, there is a kind of fretting vitriolate salt, copiously dispersed through the air, I have been inclined to think, partly by other inducements, and partly by the answers made me by a very observing man, who lived in a place, that I remember I visited; where being forced to reside a good while, he found the hangings of his chamber, and the curtains of his bed, rotted by the vitriolate steams expired by the soil, whose effluvia had also very manifest and unwelcome effects on divers other things, that were kept near that place; though on the opposite side of the river, in a town, that is not half a mile distant from this place, neither I, at my being there, heard any such thing complained of, nor the relator, who had often occasion to repair thither, observed any such mischievous effects, the soil of this latter place being chalky; whereas the other above mentioned is vitriolate, insomuch that he observed, that when the moist and blackish mould had been beaten upon by the sun, that here and there the superficial parts would be as it were besprinkled with a somewhat whitish saline efflorescence.

BESIDES the hitherto-mentioned kinds of salts, it seems not improbable to me, that the air (especially about great towns, and some other particular places) may be impregnated with volatile salts, that are of a nature contrary to acids. For that there may be places in the earth, even at a good depth under ground, that lodge such salts, I have been induced to think by the experience of an acquaintance of mine; who, hoping to find in the salt of what he supposed to be virgin-earth, the true receptacle of an universal spirit, from which he promised himself great and profitable matters, caused to be dug up a great deal of a certain clay, in a place abounding with minerals, and obtained thence, by mere distillation, no inconsiderable quantities of spirit and salt, which in divers qualities, as smell, *&c.* I judged to be near of kin to the spirit of urine or hartshorn. And yet this earth was dug up at the depth of many

feet, not to ſay yards, beneath the ſurface of the ground (as an ingenious potter, from whom the chemiſt had the clay, aſſured me upon the place itſelf) which I once viſited, to ſee ſome other choice minerals, that ennobled that ſoil; whence I would have got a quantity of the abovementioned clay, but that it being then the midſt of winter, the rain had (as the workmen ſpeak) drowned the pit.

In great cities, and alſo towns, where much wood is burnt, it is probable, that numerous particles of volatile ſalt may be diſperſed through the neighbouring air. For, as I have elſewhere ſhewn, the ſoot of burned wood, which is but that ſmall part of the ſmoke which chances in its paſſage upwards to ſtick to the chimney, does very much abound in a volatile ſaline ſpirit, which by many trials are found to have ſo much affinity to that of urine and of hartſhorn, as not to be eaſily, but by the ſmell diſtinguiſhed from it.

Beside, in ſeveral places the putrefaction of ſubſtances, that once were parts of animal bodies, may furniſh the air with volatile ſalts, as I have elſewhere mentioned, that I found, that urine, without diſtillation, will by bare putrefaction afford ſaline and ſpiritous parts, that whilſt they yet ſwim in the copious phlegm, that makes up the body of the liquor, will manifeſtly diſcover themſelves to be volatile, not only by their ſmell, but by their hiſſing with acid ſpirits, and by their diſſolving ſome bodies, and precipitating others, according to the manner of volatile ſulphureous ſalts, as thoſe that abound in ſpirit of harts-horn, blood, *&c.* And I am apt to think, that it is not only in the parts of animals, but alſo in thoſe of many vegetables, that putrefaction may either extricate or produce volatile ſalts. And I remember, I have obſerved in ſome ſucculent vegetables, that chancing to lie in a heap together, in a convenient ſeaſon of the year, to make them rot; I obſerved, I ſay, when the putrefaction was come to a certain point, that the ſtink did ſo reſemble that of carrion, that it was not eaſy for me to believe it came from cadaverous plants, not animals. And that it is not impoſſible for a vegetable to afford, without the help of an additament, a volatile ſalt, even *in forma ſicca*, may be gathered from what I elſewhere relate, of my having diſtilled ſuch a ſalt from a certain ſpiritous ſeed, though, I freely confeſs, I never obtained any (without previous incineration) from above two or three vegetables. But of this enough in this place.

I shall now add, that beſides the more ſimple ſalts hitherto enumerated, it is not unlikely, that in ſome places the air may ſometimes contain compounded ſalts. For I have elſewhere ſhewn, that ſome ſorts of ſaline ſpirits, meeting one another in the air, may there convene. And I elſewhere teach how to order a couple of liquors ſo, that one will never of itſelf afford any thing in a dry form; and yet the ſpiritous effluvia of this liquor, meeting with thoſe of the other, will exhibit a volatile and ſaline body in a dry form; though the liquors themſelves being mingled will not afford any ſuch ſubſtance. What I have elſewhere delivered concerning ſubterraneal ſteams, may make it probable, that at leaſt now and then, and in ſome places, there may be ſent up from under ground into the air, among other effluvia, ſtore of ſaline ones, which needs not be ſuppoſed all of them to be of an uncompounded nature. With which that agrees very well, that was related to me by a very intelligent acquaintance of mine, that lived long in parts of *America*, where there was a vulcano, which he and ſome others having the curioſity to viſit, told me, that before they came any thing near the fire, or were offended by the heat, not only the ſkin of his face was almoſt corroded by the ſharpneſs of the exhalations, but the colour of his hair was altered by it, which kept him from proſecuting his intended diſcovery. It is a known thing, and I have received information of it from more than one eye-witneſs, that about mount *Veſuvius*, the aſcending exhalations, that iſſue out at ſome of the holes, are of ſo ſaline and ſulphureous a nature, that part of them ſtick about the orifices of thoſe vents, in the form of flower of brimſtone, of which a learned acquaintance of mine brought away ſome quantity. And I have had brought me from ſome of thoſe vulcanos a ſtone, whoſe cavities abounded with a white ſalt, which, by fit trials purpoſely made, was found near a-kin to ſal-armoniac, and eaſily reſoluble into a ſalt, whereof one part was ſomewhat fixed, and the other very volatile; which made it highly probable, that the ſalt was compounded in the bowels of the vulcano: whence I have been credibly informed, that great quantities of it have been caſt up in the fiery eruptions, and therefore ſtore of it might in likelihood be diſperſed through the air, ſince I found the ſalt itſelf to be ſublimable.

But, beſides the ſaline ſubſtances hitherto mentioned, which may be referred to determinate ſpecies, I think it not impoſſible, that the air may, at leaſt in ſome times and places, be impregnated with corpuſcles of a ſaline nature, whether ſimple, or compounded, or of both kinds, not eaſily reducible to any of the ſorts we have been ſpeaking of, or are acquainted with. For which reaſon I ſhall not preſume to give them any other denomination, than that indefinite one of anonymous. And I have been inclined to think, there may be ſuch bodies in the air by theſe two inducements. The firſt, that the particular aerial ſalts, that have been hitherto recited, are but few, as it ſeems probable by what I have ſaid in other papers of ſubterraneal ſteams and menſtruums; and that therefore there may aſcend out of the earth into the air ſaline fumes, differing enough from thoſe, whoſe kinds we have hitherto deſcribed. But beſides this conſideration *à priori*, (as they ſpeak) experience has preſented us with ſome phænomena, that ſeem *à poſteriori* to confirm this conjecture. For there happen ſuch changes to ſome bodies, by being expoſed to the air, as though I am not ſure, and therefore ſhall not be confident, that they are mainly produced by ſome nameleſs ſubſtance of a ſaline

line nature, may yet make it allowable to ſuſpect them to proceed thence. And amongſt theſe I ſhall take leave to inſert ſome, which I deny not to be probably referrible, either to one or other of the formerly enumerated kinds of aerial ſaltneſs. For laying theſe inſtances before you together, they may, by appearing thus aſſociated, give the ſtronger probability to our opinion, that there are ſaline ſubſtances in the air. And thoſe inſtances, that are not ſo proper to perſuade you, that there are anonymous ſalts, may ſerve to confirm, that there are, at leaſt in divers places, differing ſorts of aerial ſalts. I remember I have more than once viſited old glaſs-windows, in high and ancient buildings, and found ſome of the panes of glaſs here and there corroded, as if they had been worm-eaten; which probably enough argued the ſharp and fretting corpuſcles to have been carried along with the winds, to which they were expoſed, as will not eaſily be reduced to any formerly named ſalts, whoſe being unable to corrode glaſs, eſpecially no finer than that was I ſpeak of, is ſufficiently known to chemiſts.

Besides the above-mentioned phænomena, others have occurred to me, which poſſibly it would not be thought impertinent to ſubjoin on this occaſion; but I chooſe rather to reſerve them for another diſcourſe; and now ſhould put an end to this, but that I dare not conceal from you, that I ſometimes had thoughts of trying, whether a diſcovery may not be made, what kind of ſaltneſs there is to be found in the air, and whether the aerial ſaltneſs does or does not abound there, at leaſt at this or that time. But this I freely confeſs to be ſo difficult an attempt, that all that I can offer pretends but to diſſuade you from rejecting it, as too deſperate and extravagant a thing to be fit to be tried.

And I ſpeak the leſs promiſingly of what I am to ſay in the remaining part of this paper, becauſe I have not by me any notes to aſſiſt my memory, (which I dare not truſt alone) concerning the iſſues of the not numerous trials, I had opportunity to attempt in purſuance of thoſe thoughts. This I well remember, that among other ways of making the intended aerial diſcoveries, I looked upon this as the leaſt unpromiſing, that ſuch ſubjects ſhould be carefully choſen out, as being diſpoſed to be differingly wrought upon, according to the differing ſorts of ſaltneſs, that may be found predominant in the air.

This more general way of inveſtigating the ſalts of the air may contain divers particular methods, of which I ſhall now touch upon the following three.

First, It may be worth while to expoſe to the air ſuch bodies, as we judge fitteſt to be wrought upon by the ſalt, that we think likelieſt to be met with in it. So where we gueſs the air to be impregnated with nitre, we may expoſe lime to it, or ſome other body, that we think diſpoſed to imbibe or retain ſuch a ſaltneſs. We may alſo hang up in ſuch an air clothes or ſilks died with ſuch colours, that nitrous (for inſtance) or ſalino-ſulphureous ſpirits (as ſome chemiſts call them) have been found peculiarly apt to make to fade, or to diſcolour them. In the places where we ſuſpect vitriolate ſteams to abound, ſome appropriated preparations of ſulphur, either common or metalline, may be expoſed to try, whether they will acquire a blackneſs, as I have ſeveral times found ſome of thoſe ſulphurs, though otherwiſe of no dark colour, to do upon the leaſt contact of vitriolate corpuſcles. In ſome places alſo, which are judged likely to afford ſubterraneal ſteams, gueſſes may be made, whether this or that kind of ſalt aſcends into the air, by ſpreading upon the ground, in places free from dirt and duſts, large pieces of clean and white linen cloth, that has no reliſh of ſoap or lees; and obſerving, after they have lain a competent while, whether, and how they are diſcoloured, and what kind of ſaltneſs, if any, is to be found in the moiſture imbibed by them, from the aſcending ſteams and falling dew.

The next of the above-mentioned ways of enquiring after the ſaltneſs of the air may be, to find, if it be poſſible, ſome one body, that is both capable to be wrought on by ſeveral aerial ſalts, and will be ſo differingly wrought on by them, as to diſcover which kind of ſalt it is, that has produced the change. That it is very difficult to find ſuch a body, I will readily grant; but that it may be poſſible, I will not be forward to deny. For having pitched upon copper to make this trial with, though the attempt did not ſucceed according to my wiſh, yet perhaps it was chiefly for want of time and accommodations that it miſcarried. For having taken plates of copper beaten thin, (without regarding their bigneſs, or figure, or ſmoothneſs, as things not neceſſary to my purpoſe) I cauſed the ſurfaces to be made very clean, that the colours might be the more eaſily produced, and the better diſcerned: then keeping theſe over glaſſes, wherein were placed divers ſpirits, as of common ſalt, and of nitre, partly ſincere, and partly diluted with water, I obſerved, as I expected, that though I put the glaſſes in no heat, yet there aſcended fretting particles out of the liquors, and that within leſs than a day, the ſteams of the two above-mentioned liquors had much darkened the ſurfaces of the copper plates they met with in their way, the keeping them a while in the air was not hard to know by the differing diſcolorations that appeared, which plate had been invaded by the ſaline corpuſcles, and which by the nitrous; which I did not at all wonder at, becauſe I have formerly found, as I have elſewhere noted, that whereas ſpirit of nitre will make of copper a greeniſh blue ſolution, ſpirit of ſalt will, if duly employed, diſſolve that metal into a graſs-green liquor, as the ſpirit of ſoot and that of urine will into a deep blue, almoſt like ultramarine. But, as I ſaid, the want of time, of which good ſtore may be requiſite for ſuch trials, kept me from proſecuting my attempt to an iſſue. Notwithſtanding which I look not upon the deſign as deſperate, not only becauſe of the encouragement I have already mentioned to reſume Experiment I.

ſume it; but becauſe I have obſerved pieces of malleable copper, brought me, to examine, out of an Engliſh mine, (which is yet concealed) to be overcaſt here and there with a fair verdegreaſe, which by circumſtances I judged to have been produced, not by groſs liquors, but by the air impregnated with ſteams fit to work on that metal. And poſſibly there may be other ſubterraneal bodies, and even metalline ones, that by their degree of colour, or peculiar kind of ruſt or ſtain, that they will acquire in the air, may help us to gueſs what ſubſtances, and among others what ſalts the air of that place is impregnated with. I have been in a great and ſtately houſe, which being oddly ſeated, had this peculiar inconvenience, upon the ſcore of the ſteams that infeſted the air, that thoſe that dwelt in it, as one of the chief of themſelves complained to me, could not keep their ſilver plate, of which they had great ſtore, from being blemiſhed by odd diſcolorations, or, as they ſeemed to think it, ruſt; though when it was not uſed, they carefully kept it in a place judged convenient for ſuch a purpoſe. And I have been informed by an obſerving man, who lived there ſome time, that there is nothing more generally known in *Amſterdam*, than that their ſilver plate there, expoſed a little while to the common air, tarniſhes immediately, contracting a dirty colour, partaking of yellow and black. Another inſtance or two, though not afforded by plate, I could mention to the ſame purpoſe; but I reſerve them for another place, my haſte obliging me to paſs on to the laſt of the three ways I propoſed of inveſtigating the differences of aerial ſalts.

THE third way may be looked upon, if you pleaſe, as a variation of the ſecond; but there is this difference betwixt them, that here we make uſe of metalline bodies, not crude, but already prepared by ſome chemical operations; ſo that being before hand reduced to very ſmall parts by the intervention of ſaline ſubſtances, the operation of the air upon them is wont to be much the ſooner performed. In this third way then we employ ſuch fictitious minerals or other bodies, as having for the moſt part an adventitious colour already, will change that colour by being expoſed to the air. For it ſeems not impoſſible, but that by diligently obſerving, what difference may be found in the diſcolorations produced in theſe ſubſtances by the differing kinds of ſalts, as nitrous, ſalino-ſulphureous, *&c.* that we have ſhewn may be met with in the air, ſome gueſſes may be made in a ſhort time of this or that ſalt, which has the chief ſtroke in the production of the exhibited colour. And I ſhall on this occaſion mention two or three bodies, without determining, till I be better ſatisfied, whether their changes proceed only or chiefly from the ſalt of the air; but I am content not to pretermit them, becauſe if they do not prove what I propoſe, they will at leaſt clear the meaning of it, and may however help us to gueſs at the reſemblance or difference of airs in ſeveral places, by the likeneſs or unlikeneſs of the produced changes of colour, whether theſe changes proceed from ſaline, or from any other ſubſtance intermingled with the air.

IF we precipitate a ſtrong ſolution of good ſilver made in aqua fortis, with a competent quantity of ſpirit of ſea-ſalt, we ſhall have a powder, which at firſt will be very white; but if the liquor be not poured off, this being expoſed for a good while to the air, it would acquire on the ſurface a dark colour, which perhaps an attentive eye will diſcern ſomewhat various, as this or that kind of ſaltneſs happens to be predominant in the air. Experiment II.

WE took an equal weight of good filings of copper, and powdered ſal-armoniac, which being well mixed, were put into a covered crucible, and kept in a moderate fire over ignited coals, till the ſal-armoniac had either quite or almoſt done ſmoking: then as much of the remaining maſs as could be parted, was taken out, and looked of a dark colour; but this maſs being groſly beaten, and expoſed for ſome time to the air, looked like a kind of verdegreaſe, which is a ſubſtance, whoſe colour may be obſerved ſomewhat to vary, according to the nature of the particular ſalts, which by working on, and embodying with the copper, produce the pigment. But a parcel of the ſame maſs being, before the air had time to work much upon it, groſly powdered, and hermetically ſealed in a glaſs egg, to fence it from the air, and left in a ſouth window, did not appear diſcoloured, when the out-ſide of the other parcel ſhewed like verdegreaſe: which ſeems to argue the change of colour to have been made by the aerial ſalt, if we ſuppoſe the moiſture of the air to have had no intereſt in the change, or to have concurred to it, but as a kind of vehicle aſſiſtant to the ſalt. Experiment III.

I ALSO took ſpirit of the ſoot of wood, and having poured a little of it on the filings of copper, my expectations were anſwered by my finding, that the liquor diſſolved ſome parts of the metal into a deep and lovely azure like ultramarine; and that this ſolution being ſuffered to grow dry in an open glaſs, by the mere operation of the air, the ceruleous colour very ſoon degenerated, even before the matter was quite dry, into a cyanious colour, ſuch as may be ſeen in good turquoiſes. And to manifeſt, that this change proceeded not from any peculiarity in the ſpirit of ſoot, and that this ſpirit acted as abounding with a ſalino-ſulphureous ſalt; I ſhall add, that I had the ſucceſs in a trial made with an urinous ſpirit drawn from animal ſubſtances, and put upon crude filings of copper. And in thoſe trials I ſometimes obſerved the differences of colours, that did not diſcourage me from hoping, that the proſecution of them might not be inſignificant to my purpoſe. Experiment IV.

I HAVE not been ſolicitous to deſcribe the fore-mentioned changes of colours more particularly, becauſe it had been very difficult to do ſo, and therefore I judged it more expedient not to attempt it. For there is ſo great a variety of colours, that few but painters can exactly

exactly enumerate, and distinguish them by proper names. And yet, besides those more noted ones, there are many others, for which, though our language, nor perhaps any other, is not copious enough to furnish us with distinct appellations, yet our eyes, especially when they have been attentively conversant with such objects, are sharp enough to discern them: and by the help of these nameless, as well as the stated colours, I am apt to think a heedful observer may perceive divers variations in the colours of the bodies we have been speaking of, that may assist him to guess, what substance it is in the air, whereto these diversities may be ascribed. And as nature is much more rich in things, than our dictionaries are in words, so has she furnished men with sensories capable of distinctly perceiving a far greater variety of objects, than they are able verbally to express. And this might be shewn by instances, in the organs and objects of senses less acute than sight, whose subtilty in distinguishing things I could exemplify, not only by what is related, but by what has been performed by some persons not unknown to me, particularly our famous Doctor *Harvey*. But examples of this kind I have not leisure to stay on; and therefore without spending more words upon this third way of discovering aerial salts, I shall barely recommend the care of such observations to their curiosity, who shall think it worth while to make them,

WITH how little confidence of success, trials, that have the aims of those I have been speaking of, are to be attempted, not only consideration, but experience hath made me sensible. But yet I would not discourage human curiosity from adventuring even upon slight probabilities, where the nobleness of the subjects and scope may make even small attainments very desirable. Those adventurous navigators, that have made voyages for discovery in unknown seas, when they first discerned something of obscure near the horizon, at a great distance off, have often doubted, whether what they had so imperfect a sight of, were a cloud, or an island, or a mountain: but though usually it were more likely to be the former, (as that which more frequently occurred than the latter) yet they judged it advisable to steer towards it, till they had attained a clearer prospect of it: for if it were a deluding meteor, they would not however sustain such a loss in that of no great labour, as in case it were a country, they would in the loss of what might prove a noble and rich discovery. And if they desisted too soon from their curiosity, they could not rationally satisfy themselves, whether they slighted a cloud, or neglected a country.

I DO not perceive, that the air of our inland parts is considerably impregnated with esurine salt; since I do not find the bars and casements of our windows much impaired by rust after near eighty years standing, or that they are more rusty towards one quarter than another; though the air hereabout, (*viz. Oakly* in *Buckinghamshire*) is very damp about the end of autumn, and beginning of winter. So that I conceive this salt either proceeds from the sea-vapours near the sea-coasts, or else from the dissolution of this esurine salt in the air, upon the burning of sea or other mineral coles. Mr. *J. T.*

Agricolâ de re metallica, lib. duodec.

Mox ollam ex igni removent; postea ex refrigerata eximunt halinitrum purissimum: quod candidi marmoris speciem gerit; atque tunc etiam id, quod terrenum est, in fundo residet. At terra, ex qua dilutum fuit factum, & rami quernei vel consimilis arboris alternis sub dio ponantur, & aqua quæ combibit halinitrum conspergantur: quò modo quinque vel sex annis rursus apta fit ad conficiendum dilutum. Halinitrum quodammodo purum, quod dum terra tot annos quievit interea, ortum fuit, & quod lapidei parietes in cellis vinariis & locis opacis exudant, cum primo diluto permistum decoquatur.

Si verò locus aliquis talium venarum copiam suppeditaverit, ipsæ statim non conjiciantur in castella; sed primo convehantur in areas, atque cumulentur: quanto enim diutius aeri & pluviis expositæ fuerint, tanto meliores fiunt. Nam in ejusmodi cumulis, aliquot post mensibus, quam venæ in areas fuerunt congestæ, nascuntur fibræ longe venis bonitate præstantes: deinde vehantur in sex, pluravæ castella, longa & lata ad novem pedes, ad quinque alta.

Si verò dum dilutum recoquitur, separata non fuerint, mox ex minoribus vasis infundatur in majora, eaque concludantur: in quibus item atramentum sutorium separatum ab alumine concrescit: utrumque excisum, & in hypocausto siccatum dividendatur dilutum, quod in vasis & cupis non concrevit in cortinam refusum recoquatur: sed terra, quæ in fundo cujusque cortinæ resedit, ablata in castello unà cum venis, denuo aqua & urina diluatur. At terra, quæ in castellis diluto, postquam effluxit, superfuit egesta & coacervata quotidiè, rursus magis ac magis fit aluminosa, non aliter atque terra, ex quâ halinitrum fuit confectum, suo succo plenior fit: quare denuo in castella conjicitur, & aquæ affusæ ea percolantur.

A LEARNED observer, who practised physick in one of the most southern of the English colonies, being asked by me about the effects of the air there upon iron; affirmed to me, that the great guns there are so subject to become rusty, that after they have lain a very few years in the air, one may with a hammer knock off whole scales, or rather cakes of crocus martis: and he observed, that those guns, that lay only exposed to the air, did this much more than those, that by accidents were drowned, and lay covered with the salt water.

AND since dew is made of steams of the terrestrial globe, which whilst they retain that form, and were not yet convened into drops, did swim to and fro in the air, and made part of it; the phænomena, that shew the power of dew in working on solid bodies, may help to manifest, how copiously the air may be impregnated with subtil saline parts. Wherefore I shall here add, that having met with a person, that was bred as well a scholar as a traveller,

veller, and had viſited not only ſome of the maritime places of *Braſil*, but ſome of the inward parts of that vaſt country, I enquired of him about the ſubtilty of Braſilian dew, and its power to ruſt metals: about which he told me, that it was certainly very great, and would not only ruſt knives and ſuch inſtruments, but likewiſe money, which he aſſured me he had particularly obſerved; adding, that in ſeveral places the Portugueſe kept their great guns caſed over, that the dew might not fall upon them, and by its corroſiveneſs ſo ruſt them, as to be apt, after a while, to break in the diſcharge. And when I demanded whether he taſted the dew, to obſerve the ſaltneſs of it? he replied, that he had not, but that he had in divers places obſerved, that it left the graſs, *&c.* that it had reſted on, covered over with a pure white ſalt, as if it had been a hoar froſt.

An ingenious traveller, and ſtudent of phyſick, being diſcourſed with by me about ſome particularities of his country (which is *Swedeland*) relating to minerals, and their effects upon the air, aſſured me, that in a city, or notable town called *Fahlun*, which is built on the lower part of an hill, containing one of the beſt copper mines in *Sweden*, the exhalations, that are copiouſly emitted by the latent minerals, do ſo affect the air in and about the place, that their ſilver coins are oftentimes notably diſcoloured by them, not ſeldom made even black or blackiſh, though the money be kept well tied up in bags or purſes, and theſe perhaps placed one within another, and the whole aggregate be kept locked up in coffers or preſſes made of wood of perhaps an inch thick: he added, that theſe ſubterraneal ſteams have manifeſt effects upon braſs, (wherewith that country abounds) inſomuch that there being kept in the principal church ſeven crowns made of that metal upon a particular occaſion, the ſulphureous ſteams made thoſe, that looked to them, take the pains to cleanſe and brighten them at a month's end, till finding, that the labour was every month to begin again, they at length grew weary of it, and ſuffered theſe crowns to grow, as they yet continue, as black (to uſe his own phraſe) as the tunnel of a chimney; this he averred to be true, as having a good opportunity to be ſure of it, in regard of his being a native of this town. And he further aſſured me, that the corroſive exhalations did ſo penetrate the bars and veſſels of iron, that lye expoſed to the air, that after a while, it is eaſy with a hammer to knock off ſcales of Mars, which are friable into a powder, like crocus, ſave that the colour is more dark.

TITLE XII.

Of Sulphur, and inflammable particles in the air; and of lightening, and its effect.

YESTERDAY a Neopolitan lord, a perſon of high quality, and very curious, being aſked by me ſome queſtions about ſome natural phænomena relating to *Veſuvius* and the adjacent country? aſſured me, that having had occaſion to ſtay for divers months at a country houſe but little diſtant from *Naples*, he took much pleaſure, taking the air on horſe-back upon a very ſulphureous ſoil, to take notice of divers obſervables to be met with there; and that he often found, that when his horſe trod ſomething hard upon the ground, there would be produced a great, and as it were a crackling noiſe, which would have frighted a ſtranger; and that oftentimes he could diſcern, that where his horſe had trod, there would preſently ariſe a duſt, and fumes that were manifeſtly ſulphureous and ready to take fire: adding, that ſometimes he thought that they actually did ſo. He further told me, that he ſometimes, for curioſity ſake, cauſed ſome clods, or as it were turfs, to be cut out of that ſoil, and laid in a kind of heap; and that then in the night he could obſerve, that the ſteams, that plentifully iſſued thence, would ſometimes be kindled by or in the air, as they aſcended in it.

The ſame nobleman told me, that when ſome years ago there were eruptions of fire in mount *Veſuvius*, he and others obſerved, with amazement and horror, that the flame, which ſhot up into the air, from the *Volcano*, was of ſo prodigious a height, as invited them to meaſure it with a quadrant, by which they found it to be near two miles high: and when I aſked, if he compriſed in that height the altitude of the mountain itſelf? he anſwered, that he did not, for the flame, that appeared above the top of the mountain, appeared as high as the mountain itſelf; and it was from the top of the hill, and not the bottom, that they computed the height of the flame. He added, that ſometimes the earth would tremble, and there would be diſcharges of ſuch vaſt ſtones, and other heavy things, that he ſaw ſome maſſes of ignited matter thrown up a great way into the air, that were bigger than the chamber he did me the honour to viſit me in, though that were a large room for a bed-chamber.

Voila tout ce qu'on peut dire de cette iſle, qui ſemble un enfer, car on voit la mer du port, & de la coſte toute noire & brûlée d'un petit eſcueil, qui paroiſt depuis environ ſoixante ans, & d'ou on vit ſortir en ce temps là une grande flamme, qui y a laiſſé une ouverture ſi profonde, que ſi on y jette une pierre, on ne l'entend point tomber. Mais ce qui eſt arrive depuis en ce port, n'eſt pas moins eſtonnant: je le rapporteray icy comme je l'ay appris de diverſes perſonnes en pluſieurs endroits. *Voyage de Levant, p.* 203.

Il y a environ 18. *ans, que durant la nuit d'un certain dimanche, commenca dans le port de Santorini un tres grand bruit, lequel s'entendit juſques à Chio, qui en eſt eloigné de plus de deux cent milles, mais de telle ſorte, qu'on crut à Chio, que c'eſtoit l'armée Venitienne, qui combattoit contre celle des Turcs, ce qui fit que dés le matin chacun monta aux lieux les plus élevez pour en eſtre ſpectateur, & me ſouviens que le reverend pere* Bernard *ſuperieur des Capucins de Chio, homme venerable,* *Accident extraordinaire à Santorini.*

venerable, & tres digne de foy, me conta, qu'il y avoit eſté trompé comme les autres, car il crut auſſi bien qu'eux entendre pluſieurs coups de canon; cependant ils ne virent rien, & en effet ce fut un feu, qui ſe prit dans la terre du fond du port de Santorini, & y fit un tel effet, que depuis le matin juſqu' au ſoir il ſortit du fond de la mer quantite de pierres de ponce, qui montoient en haut avec tant de roideur & tant de bruit, qu'on euſt dit, que ce fuſſet autant de coups de canon, & cela infecta tellement l'air, que dans la dite iſle de Santorini, il mourut quantité de perſonnes, & pluſieurs de la meſme iſle en perdirent la veue, qu'ils recouvrerent pourtant quelques jours apres. Cette infection s'eſtendit auſſi loin, que le bruit qui l'avoit precede, car non ſeulement dans cette iſle, mais meſme a Chio, & à Smyrne, tout l'argent devint rouge, ſoit qu'il fut dans les coffres, ou dans les poches; & nos religieux demeurans en ces lieux là me dirent que tous leurs calices en eſtoient devenus rouges. Au bout de quelques jours cette infection ſe diſſipa, & l'argent reprit ſa premiere couleur. Ces pierres de ponce, qui ſortirent de la, couvrirent tellement la mer de l'Archipel, que durant quelque temps, quand il regnoit de certains vents, il y avoit des ports qui en eſtoient bouchez, en façon qu'il n'en pouvoit ſortir aucune barque, pour petite qu'elle fut, que ceux qui eſtoient dedans ne ſe fiſſent le chemin au travers de ces pierres de ponce avec quelques pieux; & on en voit encor à preſent par toute la mer Mediterranée, mais en petite quantité, cela s'eſtant diſperſé ca & là. Seneque raconte en une de ſes epiſtres, que Santorini eſt baſtie ſur des mines de ſouphre, & ce ſont elles, qui fourniſſent aſſeurement la matiere pour allumer ce feu. On dit qu' Alexandre le Grand meſura la mer en cet endroit, & n'y trouva point de fond. Il y a pourtant une petite iſle appellée Fireſia, à la pointe de laquelle on peut donner fonds, & point en aucun autre endroit.

It has been often obſerved, that upon the falling of thunder there has been produced in the air, near the places where it fell, a ſtrong odour of burnt brimſtone. And I remember, that being one night at a town built almoſt upon the great lake of *Geneva*, anciently called *Lacus Lemanus*, the thunder was ſo violent, as much frighted the inhabitants; though (by reaſon of the neighbourhood of the high mountains of *Savoy* and *Switzerland*) thunders be very frequent there: and the next day I had a great complaint made me, of the ſtrong ſtink of ſulphur, produced by the thunder, that fell hard by into the lake and was ready to overcome by its ſmell, even a ſoldier, that ſtood centinel near it.

On *July* 24. *An.* 1681. the ſhip Albemarl, whereof Mr. *Edward Lad* was then maſter, being an hundred leagues from cape *Cod* in latitude 48. about 3 P. M. met with a thunder ſtorm, the lightning burnt the main-top-ſail, ſplit the main cap in pieces, rent the maſt all along. There was in ſpecial one dreadful clap of thunder, in report bigger than of a great gun, at which all the ſhip's company were amazed: then did there fall ſomething from the clouds upon the ſtern of the boat, which it broke into many ſmall parts, ſplit one of the pumps, the other pump much hurt: it was a bituminous matter, ſmelling much like fired gunpowder: it continued burning in the ſtern of the boat. They did with ſticks diſſipate it, and poured much water on it, and yet they were not able, by all they could do, to extinguiſh it, until ſuch time as all the matter was conſumed. But the ſtrangeſt thing of all is yet to be mentioned.

When night came, obſerving the ſtars, they perceived, that their compaſſes were changed. As for the compaſs in the biddekel the north point was turned clear ſouth. There were two other compaſſes unhung in the locker in the cabin, in one of which the north point ſtood ſouth like that in the biddekel. As for the other the north point ſtood weſt, ſo that they ſailed by needle, whoſe polarity was quite changed. The ſeamen were at firſt puzzled to work their veſſel right, conſidering, that the ſouth point of their compaſſes was now become north; but after a little uſe it was eaſy to them: thus did they ſail a thouſand leagues. As for the compaſs, wherein the lightning had made the needle to point weſtward; ſince it was brought to *New England* the glaſs being broken, it has, by means of the air coming to it, loſt its virtue. One of their compaſſes, which had quite changed the polarity from north to ſouth, is ſtill extant in that country, in the hands of Mr. *Increaſe Mather*; the north point of the needle doth remain fixed to this day, as it did immediately after the lightning cauſed the alteration.

An induſtrious gentleman, that was long an eminent planter of trees, wherewith he furniſhed many of his neighbours, preſented me with a piece of a branch, that ſeemed to have had a ſlit, for it reached thorough the bark almoſt to the very wood, from one end to the other, but had now the lips of the wound overgrown on each ſide with new bark: of this kind of gaſhes, he told me, he found in other branches of the ſame tree, which made him think, that ſome envious knave had done this in ſpite: but conſidering the circumſtances more curiouſly, he found that conjecture much diſcountenanced by ſome of them, and ſuſpected, that theſe wounds muſt have been made by ſome deſignleſs agent. For by his own obſervations, and thoſe of his friends, it appeared, that theſe fiſſures are to be met with, not only in divers others of his own trees of differing kinds, and in differing plantations, but alſo in the trees of ſeveral others, which though growing in the ſame country, were remote enough from his: ſo that it having been obſerved with ſome wonder, that in the foregoing ſeaſon, lightnings had been very numerous and frequent, he and his friends concluded, for reaſons, that need not be here repeated, that the above-mentioned gaſhes were ſome of the odd effects of thoſe lightnings, which kept me from wondering at his negative anſwer, to the curioſity I had to know, whether all theſe wounds of the trees looked the ſame way, as eaſt or weſt,

weſt, north or ſouth. For I had formerly obſerved, that the ſame fulmen or flaſh of lightning reaching to the earth in the form of fire, appeared by the recent effects, as well of its impetuous motion, as of its violent heat, to have moved in an irregularly winding-line; which made me compare its motion to that of a ſquib, and helped me to ſolve ſome odd phænomena of lightning, that this is not the fitteſt place to diſcourſe of: the foregoing mention of what happened to the trees, being deſigned, partly to preſerve the memory of an unuſual phænomenon, and partly to ſhew, that whatever is wont to happen in animals, lightning is not always deſtructive or corruptive of vegetables, ſince the wounds inflicted to trees were happily cicatriſed, and did not kill or poiſon the plants. And whether this phænomenon were produced by ſome mineral exhalations kindled in the air, or by the violent and irregular motion of ſome ſuch ſubſtance, or by both together, the phænomenon will be pertinent to the ſubject or deſign of the preſent tract.

TITLE XIII.

Of celeſtial influences or effluviums in the air.

To Mr. *HARTLIB.*

DEAR SIR,

I SHALL not I hope altogether forget the charge, which you have been pleaſed to lay upon me, in reference to the conſideration of all winy liquors, their affections, and the ſeveral diſtempers incident to them, with my thoughts about the preſerving of them, ſo as may beſt retard the quickneſs of their motion, and hinder their dyſcraſy and corruption.

To which end an exact ſcrutiny into the air, its quality, temperament and motion, and an enquiry of the efficacy and force, that this hath upon all ſuch bodies, will be in ſome meaſure neceſſary.

AND this puts me in mind to leave one requeſt with you, *viz.* to beg your aſſiſtance and countenance on all occaſions to Mr. *Streete*, when he ſhall at any time wait on you, who both as to his undertaking, and to the modeſty and ſimplicity of his ſpirit, doth very much emulate our ſo much joint eſteemed friend Mr. *Mercator*, who, though he may differ from the former, in reference to his method, or to ſome of the profounder parts of learning; yet I think it very poſſible to reconcile them in the main, and cannot but expect ſomething extraordinary in the aſſerting and perfecting of the theory of the planets, will be brought forth between them, which I ſhould the more gladly ſee, by how much moſt ſcholars complain of it, as of a thing hitherto wanting, by how much alſo I gueſs, that having the examples of ſo many who have already attempted the ſame thing in vain, they will find themſelves the more conſtrained to lay down ſome new choice, ſingular and undeniable hypotheſis, for the better invitation of the admittance of their opinion among learned men, although ſuch a work be no leſs neceſſary alſo for other reaſons.

FOR if we aſſert not the theory of the planets rightly, and upon ſuch ground as are indubitably demonſtrable, we ſhall never be free from errors and diſagreements in opinion about their motions, and the right calculation of them.

AND if we miſtake in either of theſe, we muſt miſtake of the true place in the heavens, in which each planet is, or conſtantly ought to be: and if we at all err in our judgment of their due places, it is impoſſible we ſhould aſſert their ſeveral aſpects, and the mutual influences and virtues they have (through this) one upon another: and ſo the phyſical uſe of their motions falls to the ground wholly, or at leaſt becomes ſubject to very much uncertainty.

AND truly, if there be no ſuch uſe at all of the motions of theſe bodies, as that which I may call phyſical, *viz.* for predicting, and for (in ſome meaſure) determining the affections, diſpoſitions, and alterations, that are introduced into ſeveral things here, either immediately, or into the air immediately, by reaſon of the courſe of theſe ſuperior bodies, it would very much leſſen and depreciate with me that toil, coſt, pains, watchings, and continual exerciſes and endeavours, that have been uſed for the gaining of exact obſervations in aſtronomy. Seeing when we have done all, and obtained all beyond the mere bare knowledge of them, we can propound no end, benefit, uſe or advantage, that may recompenſe the trouble and pains beſtowed upon them, (at leaſt upon ſome of them) nor ſo much as any real or particular relation between us and them; and if ſo, we know them only to know them.

BUT we ſhall at preſent preſume the contrary, and therefore ſhall crave leave to ſay, that although ſeveral objections are commonly brought againſt any ſuch uſe or application of theſe bodies, or of their power, influence or motions, which are occaſioned partly by the ſuperſtition and paganiſm incident to this kind of doctrine, partly by the impoſture, ignorance, and want of learning, generally obſerved in the perſons profeſſing this knowledge, partly by the manifeſt miſtakes and uncertainty, that there is in the predictions of this nature, and partly by the inexplicableneſs of the way or manner how they come to affect one another, which admits not, as many conceive, of an eaſy, viſible, or familiar demonſtration: yet all theſe objections, if thoroughly examined, do not, as we humbly conceive, really null or take away the poſſibility of the thing ſimply, but are raiſed rather againſt the enormities and imperfections, that are confeſſed to be in it; and it may, notwithſtanding all thoſe objections, ſtill be certain, that theſe celeſtial bodies, (according to the angles they make one upon another, but eſpecially with the ſun or

with the earth in our meridian, or with ſuch and ſuch other points in the heavens) may have a power to cauſe ſuch and ſuch motions, changes, and alterations, (ſtronger or weaker, according to the nature of the angle) as the extremities of which ſhall at length be felt in every one of us: and this may be evidenced, 1ſt, by undeniable experiments, not only from things inanimate and vegitative, but from the undoubted obſervations of phyſicians, as well in ſeveral chronical as acute diſtempers, and more eminently in all lunatick, epileptick, paryalitick, or lethargick perſons. 2dly, It may further admit of a demonſtration; for if the extreme motions of phyſick be generation and corruption, and the mean motions rarefaction and condenſation, allowing then theſe bodies to have a ſhare in promoting the mean motions, (*viz.*) of rarefaction and condenſation, we ſhall or may ſoon be convinced, that their effects then upon all other things here cannot but be exceeding conſiderable.

For the better underſtanding of which, I ſhall offer a little more largely to you my conceptions, *viz.*

That to ſpeak properly and ſimply, I take generation and corruption to be the extremes of motion, rather than motions themſelves; for the ſcope, intentions, or effects of all phyſical motions (ſtrictly ſo taken) are only to one of theſe ends, *viz.* either for generation or corruption; and theſe two are they alſo, which limit and bound all motion; for beyond theſe metes there is no phyſical progreſſion, and therefore theſe two muſt be the true *termini*, as well *à quo*, as *ad quem*, of all ſuch motion, ſeeing all things are corrupted to be generated, and all things generated are at length corrupted.

But if theſe be rather the *termini* and extremes of motion, than motion itſelf, we muſt acknowledge there are motions, which nature uſeth as means, between theſe two extremes; which mean motion muſt be as oppoſite alſo one to another, as the two extremes. Otherwiſe we ſhould never be at a certainty, which way nature intends by her motion: otherwiſe alſo we muſt ſay one and the ſame courſe, or one and the ſame thing in nature, may ſimply and of itſelf be the immediate cauſe of generation and corruption, of life and of death, of hardneſs and ſoftneſs, which is abſurd and impoſſible.

Now as theſe two motions of rarefaction and condenſation are oppoſite one to the other, as is required, ſo do they ſquare to all other the inſtruments and phænomena in nature, (*viz.*) the one anſwering to heat, the other to cold; the one to hardneſs, compactneſs, and aridity, the other to gentleneſs, ſoftneſs, ſweetneſs, maturity, *&c.*

For which reaſons therefore, as well as for many other, which might be urged, (if inſiſted on) we do conclude, (ſubmitting it nevertheleſs to be examined) that generation and corruption, rarefaction and condenſation, is the ſimpleſt, plaineſt, and trueſt analyſis, that can be found in nature, for all phyſical motions, as unto ſome of which all motion, purely phyſical, may (as we humbly conceive) without ſtraining, be immediately referred, and as by and through which all may likewiſe with as little difficulty be reſolved.

And having laid this as a ſecond argument, we ſay thirdly, that it cannot be denied, but all the affections and diſpoſitions of moiſture, heat, cold, drought, the courſe of all winds, ſhowers, thundering, or whatſoever elſe is uſed by nature, to produce theſe two general and univerſal effects of rarefaction and condenſation, do in great meaſure, if not wholly depend upon, and are altogether regulated by the courſe, motion, poſition, ſituations or aſpects of the ſuperior and celeſtial bodies or planets. And therefore, 4thly, we ſay, that every planet hath its own proper light: and as the light of the ſun is one thing, the light of the moon another, ſo every plant hath its diſtinct light, differing from all the other. Now we muſt either ſay, that this light is a bare quality, and that the utmoſt uſe and end of it is only to illuminate; and there is no light but is accompanied further with ſome power, virtue or tincture, that is proper to it; which if granted, it will inform us then, that every light hath its own property, its own tincture and colour, its own ſpecifick virtue and power; and that according to the ſeveral bodies of light, there are ſeveral properties, tinctures and powers; and that as one ſtar differs from another in glory, (according to the apoſtle) ſo one ſtar and one planet differs from another in its virtue, in its colour, in its tincture, and in its property.

And conſequently, that thoſe eminent ſtars and planets, that are in the heavens, are not to be conſidered by us as ſluggiſh inergetical bodies, or as if they were ſet only to be as bare candles to us, but as bodies full of proper motion, of peculiar operation, and of life; the ſun not only ſhining upon the reſt of the planets, but by his quickning warmth, awakening, ſtirring, and raiſing the motions, properties and powers, that are peculiar to them. According therefore to the angles, they make with the ſun, and according as they are more or leſs enlightned by him; according alſo as they are at the ſame time more directly or more obliquely, more remotely or more nearly ſituated and placed in reſpect to us; ſo muſt the effects of the powers, virtues and tinctures, that are proper to them, be more or leſs felt by us. 5thly, For the manner of the planets tranſmitting theſe their properties and powers, and of their affecting other bodies at ſo remote diſtance, there is nothing begged or required in it, that is inſuperable to a man's apprehenſion or belief: ſeeing,

1. We affirm not any property, operation, virtue, or power, to be tranſmitted from any of the ſaid planets, but what doth deſcend with its light, and is the real property of its light.

2. No man judgeth, that the light of any planet, or of the ſun itſelf, is refracted, or by any other means weakned, hindred, or impaired by the æther, (or that ſubſtance which fills up the ſpace between one planet and another) through which it paſſeth; but that it doth deſcend whole directly and inrefracted unto, or upon our atmoſphere.

3. But whatsoever is received by the atmosphere, is also received by the thin and subtile air, that is contiguous to the atmosphere: and this air therefore cannot but be capable of being moved, stirred, altered, and impressed by these properties, virtues and lights, as penetrating each part of it.

4. Not only the air, by reason of its thinness and subtilty, is capable of being thus penetrated, moved and altered by these planetary virtues and lights; but forasmuch also as our spirits, and the spirits likewise of all mixed bodies, are really of an aerious, ethereal, luminous production and composition; these spirits therefore of ours, and the spirits of all other bodies, must necessarily no less suffer an impression from the same lights, and cannot be less subject to an alteration, motion, agitation and infection through them and by them, than the other, (*viz.*) the air: but rather as our spirits are more near and more analogous to the nature of light than the air, so they must be more prone and easy to be impressed than it. And if our spirits, and the spirits of all mixed bodies may be altered, changed, moved and impressed by these superior bodies, and their properties; then these spirits being the only principles of energy, power, force and life, in all bodies wherein they are, and the immediate causes through which all alteration comes to the bodies themselves. It is impossible therefore spirits should be altered and changed, and yet no alteration made in the bodies themselves: and therefore a less limit or extreme cannot be set to the power or operation, or force of the superior bodies upon the inferior, than what must terminate at length into the very bodies themselves.

5. As a further confirmation or proof of this, in reference at least to ourselves, I shall offer to your consideration the accidents, that often happen to men, by the mere air, as convulsions, cramps, blastings, lameness, colds, many of which endure a man's life-time; and which (with many bitter infirmities, that sometimes seize upon a man, while standing, walking, or lying in the air) are rarely or never felt or discerned at the instant of their approach or insults upon a man, nor yet accompanied with the sense of any excess in the air for heat or cold at that time, and therefore not well referrible to any cause in the air, if not to the power of those properties and operations of the celestial bodies that we speak of; and this I submit to the judgment of common experience.

6. Lastly, as the sun shining on the rest of the planets doth not, as we said, only barely illuminate their bodies; but besides this, through the power, virtue, and activity it hath, doth also raise, excite, awaken and stir up the several properties and dispositions, that are in those several and respective bodies, whereby they are more lively and effectually brought forth upon us; so we are to suppose it is in reference to this our planet, which is the earth, which is not only enlightned, warmed, cherished and fructified by the power, virtue and influence of the sun, but hath its proper magnetical, planetary virtue also fermented, stirred, agitated and awakened in it, which it remits back with the reflected light of the sun; and together with this magnetick planetary property of the earth, which is stirred and raised by the sun, are awakened also the seminal dispositions, odours and ferments, that are lodged in, and proper unto particular regions or places, which do likewise emit and diffuse through the air, as their several and respective benign, grateful, so their several malignant, congelative and fracedonous natures and qualities.

And hence therefore, though the air, its temperament, disposition and quality in general, is to be looked at according to the motions, influences and aspects of the several superior bodies; yet the particular healthfulness and unhealthfulness of the places, the evil disposition of the air, evenings, nights, and early in the mornings, in some parts more than in others; the superabundant moisture, excessive winds, droughts or other seasons proper to one country, and not to be observed in another neighbouring to it; all these are rather to be allowed and referred to those odours, vapours and exhalations, that are through the power of the sun, or other planets, drawn forth from their particular seats into the air, from the planets themselves.

And thus I have hinted, as well as I may, at the solutions of all the phænomena pertaining to this matter, that I can think of.

And if this be so, then wholly to neglect this physical use (and consideration) of the motion of these bodies, and either to reject it, because of the superstition, that hath been mixed with it, or to exclude it from all manner of care, and from all other further scrutiny, as a thing not worth our enquiry or search at all after, is as great an extreme on the other hand, and a mistake, that must not pass untaxed among learned men.

You did not expect, I am sure, I should have adventured into so particular an apology for astrology; nor do I intend it, when I begun my letter; nor do I now aim to justify any thing farther, than what may properly, if not necessarily fall into the consideration of natural philosophy, being indeed much induced to think, that were the theory of the planets so exactly stated, so perfectly, or so undeniably demonstrated, that we might be sure we rightly understood the place, course and position of each of their bodies in the heavens; this other doctrine of their physical use, with the weight, dignity, extent, considerableness or inconsiderableness of it, would soon confirm and demonstrate itself by the evidence and proof of itself; especially if any will please to take the pains to calculate these motions for his own private use, and according to the meridian he was in, and so compare them with his own observations of the change and alteration of the air from day to day. Which doubtless, as it is the way at first taken by the ancients, to find out their efficacy, I mean the making such a constant observation, and keeping such a diary) so the doing

doing of that again, and giving us firſt an hiſtory or diary of the obſervations of the weather, and its changes in all reſpects, and then an account of the ſeveral places, motions, or aſpects, each day, of the ſeveral bodies of the heavens, with the agreements, doubts, or diſagreements, that theſe bear one to another, and that muſt neceſſarily riſe thereupon, would be that, that could not but prove both ſatisfactory and delightſom to us in this great point, about their phyſical power and uſe.

AND the commodity of this in our oeconomical or civil concerns in huſbandry, in gardening, in phyſick, and to the producing many other very ſtupendous effects, cannot poſſibly be ſo well credited or diſcerned as it would, if ſome ſuch plain foundation and demonſtration of the power of theſe bodies in general were laid. Which methinks we ſhould be much the more encouraged to undertake, having an advantage given us in this age, beyond what moſt ages ever had, by the uſe of thoſe rare inſtruments, that they call the thermometers, or weather-glaſſes.

AND truly when I conſider, that things of the greateſt conſequence do oft-times depend upon the moſt common obſervations; and that matters of the higheſt improvement do receive their beginning from mean, ſmall, ordinary experiments; I would have no man, who hath leiſure, opportunity, and time, to think it a ſlight thing to buſy himſelf in collecting obſervations of this nature. It being much more commendable for a man to preſerve the hiſtory of his own time, though but in the obſervation of the motions of this kind, than to ſay, upon every occaſion that offers itſelf, this is the hotteſt, or this is the coldeſt, or this is the rainieſt, or this is the moſt ſeaſonable or unſeaſonable weather, that ever he felt; whereas it may perhaps be nothing ſo.

AND if there were no other uſe, yet obſervations of this nature would much conduce to compleat the natural hiſtory of any place; as we may obſerve by that learned author, who writ *Hiſtoriam Naturalem Braſiliæ*; and who, to prove not only the habitableneſs, but healthfulneſs of that climate and country, exhibits the account of every day's weather, obſerved by him for many years together, and ſo the agreement of it to that temper, which we account healthful.

BUT the inſtituting and perfecting of accurate obſervations of this nature, by the help of ſeveral large and exact thermometers, placed in ſeveral rooms, or expoſed after ſome convenient manner to the air itſelf, would be a more noble and uſeful undertaking than ordinary. I ſay, the doing this accurately, by large and exact glaſſes, by placing ſeveral of them, either together, or at ſome fit diſtance one from another; it being much to be lamented, and that which I cannot but complain to myſelf of, that no improvement conſiderable hath, as I can learn, been made by any man, of theſe glaſſes, either in our own country, or any where elſe, ſince their firſt invention, (but only to hang them in a room for ornament ſake) there being many things yet wanting, that were much to be deſired for the perfecting of them. For,

1. NONE hath hitherto given us the beſt proportions between the diameter of the head, and the diameter of the bodies or cylinder, although this be indeed the very firſt conſideration, and that which is moſt neceſſary in the uſe of theſe inſtruments; for as by how much the bigger the cylinder is, and by how much the leſſer the head, by ſo much the more ſlow and imperceptible the air's alteration and motion will be; ſo by how much the bigger the head, and ſmaller the cylinder is, by ſo much the more quick, ſubtile, and diſcernible will every ſmall difference of the air appear; which therefore being on both ſides capable of an extreme, ought to be regulated neceſſarily according to ſome mean.

2. ADMITTING a mean or convenient proportion between theſe two diameters, to be as one to 16, or one to 24; we in the next place do no leſs want the fitteſt proportion for the length of the cylinder, which muſt doubtleſs alſo be varied anſwerably, as we vary the proportion of its diameter; the ſmaller cylinder in proportion to its head requiring the greater length, the bigger cylinder on the contrary the ſhorter length.

3. I HAVE not hitherto ſeen any cylinder, that hath been well graduated, 12 or 16 degrees being the moſt, that are ſet upon the common weather-glaſs; whereas to the making of accurate obſervations, it would require a cylinder to be divided into at leaſt 360 parts; though I think it neither unreaſonable nor unpracticable, to have one divided into 1000 parts, allowing but 10 degrees to each inch, which is no unuſual diviſion, ſeeing ſuch an one will much better diſcover, not only the ſmall, but the more ſudden and remarkable changes of the weather, (which are of chiefeſt uſe) than any others, that are common and ordinary.

4. ALTHOUGH no liquor ought to be uſed in theſe glaſſes, that is ſubject to froſt, yet we have little or no account what thoſe liquors are, that might be beſt or fitteſt for the accurate making of thoſe experiments, whether thoſe, whoſe property it is ſomewhat to attract the air, and ſo to preſerve themſelves in at leaſt their firſt quantity, as *oleum ſulphuris per campanam, ol. vitrioli, liquor ſalis tartari*, &c. Or 2dly, whether thoſe, whoſe parts are fineſt, ſubtileſt, and neareſt of kin to the air, ſuch as is ſpirit of wine, ſpirit of terebinth well rectified, and according as there is occaſion ſtill freſh ſupplied. Or 3dly, whether thoſe, that are of a middle nature, as ſtrong ſpirit of vinegar. Or 4thly, whether inſtead of theſe, and beyond theſe, it may not be beſt to uſe only well refined quickſilver.

ALL which ſeveral particulars, as they are neceſſary, and ought to be firſt aſcertained, yet they are but preliminary to the experiments themſelves.

IN the making of theſe experiments themſelves, therefore it would be convenient, 1ſt, That ſeveral thermometers of one proportion, length,

length, and graduation in the cylinders in all reſpects, as near as may be, were ſet in one frame together, either with one and the ſame, or with variety of liquors. 2dly, That ſeveral of theſe frames were ſet in ſeveral rooms; and that ſome were expoſed immediately to the air itſelf; yet ſo as it may be conveniently ſheltred from the actual rays of the ſun, and from the injury of ſtorms, rain, and winds.

In the hiſtory itſelf there cannot be too much care and exactneſs; provided the air of the chimney, cranny of a wall or door, breath of people, or other ſuch accidents do not interpoſe to deceive a man's obſervation, which muſt be circumſpectly foreſeen and conſidered.

The proportion between the warmth of the day and night in conſtant weather; the agreement or diſagreement of the motion of the air, with the motions of the ſuperior bodies, in all uncertain, changeable, and inconſtant weather; the efficacy or inefficacy through theſe in foretelling of winds and rain; the air its particular diſpoſition under thunder, under times of mildews or blaſtings, eminent eclipſes, conjunctions, with many other the like particulars, which will of themſelves be incident to an ingenious, diligent, apprehenſive perſon, may be the ſubject of this hiſtory.

I shall not digreſs ſo far, as to tell you, what other things may be done by the help of this excellent inſtrument, this being not pertinent to our preſent purpoſe.

Yet it is certain, that *Drebble*, that great, ſingular, learned mechanick, did by the help of this inſtrument, make a dial continually to move of itſelf, regularly ſhewing both the time of the day, and other motions of the heavens; did alſo make an automatous inſtrument of muſick, and found out a furnace, which he could govern to any degree of heat: but whether theſe have died with him, or how far the meditations of others have wrought upon them, I ſhall humbly refer to a more leiſurable enquiry. And if you can inform me among any of your acquaintance or correſpondents, I ſhould be glad to hear and to learn any thing of this nature, or relating to the further uſe, experiment, or improvement of this rare little inſtrument, or to the further clearing, ventilating, or diſcuſſing the theory or doctrine of the planets, or the phyſical uſe and power of theſe bodies, that we have thus briefly made an eſſay of. Thus far that letter.

They have a received tradition in *Java*, and probably in divers other iſlands of the *South Sea*, that the beams of the moon are wont to cauſe contractures in the body of thoſe men, that ſtay too long expoſed to them: the truth of which tradition was lately confirmed to me by an ingenious doctor, that with applauſe practiſed phyſick in thoſe parts; who aſſured me, that he had obſerved, that upon the account before-mentioned ſome were made lame, or elſe had ſome of their limbs contracted for divers weeks, and ſome for many months, or even a longer time. And when I aſked him, whether he had at any time been ſubject to that miſchief himſelf? he anſwered, that whilſt he was a novice in thoſe parts, after a very hot day, he laid himſelf down very ſlenderly covered, to ſleep (according to the cuſtom of the place) near the door of the houſe he lodged in; but being unacquainted with the tradition, he unſkilfully choſe a place, upon which the moon could fully beat for a good part of the night, which being paſt before he waked, when he went to riſe, he found his neck ſo ſtiff, that he was ſcarce able at all to ſtir it; and his mouth was ſo drawn away, that it was hideous to behold, and continued ſo unſightly, that ſhame forced him to keep within for ſome days, during which he made uſe of briſk aromatick medicines, by whoſe help he got off a contracture, that uſed to ſtay very much longer with others. And when I aſked him, if theſe diſtempers were not occaſioned rather by the coldneſs of the night and ſubtility of the air, than the operation of the moon's beams? he anſwered me, that it was generally obſerved, that the other cauſes, without the direct beams of the moon, were not wont to produce ſuch bad effects; and that his landlord, when he ſaw his mouth awry, told him, that if he had made him acquainted with his deſign to paſs the night in the open air, he would have prevented this miſchief, by lodging him in a place unexpoſed to the moon's light.

TITLE XIV.

Of the height of the atmoſphere.

TITLE XV.

Of the motion of the air, and of winds.

Extract of a letter from Fort St. George, *dated* January 23, 1668.

Although the bar of *Porta Nova* proved more ſhallow and dangerous than we were informed, yet ſhe (our ſhip) got ſafe in thither; and it was well ſhe did ſo. Had we kept her here, there had been no poſſibility of her eſcape from periſhing in a dreadful ſtorm, or rather hurricane, which happened here the 22d of *November*; the like hath not been known here in any man's memory. The tempeſt of wind and rain was ſo exceeding violent, that nothing could ſtand before it; men and beaſts carried into the ſea by the violence of the winds and floods; the generality of the houſes in this and the neighbour towns were ruined; ſcarce any trees left ſtanding in gardens or elſewhere; the wall in this town laid flat in ſeveral places; your

your godownes and other houſes in and about the fort uncovered, and exceedingly ſhattered: no place in the fort, where we could keep our perſons, books or papers free from the wind or rain; nor ſcarcely any doors could ſtand againſt the violence of it; and we hourly feared the falling of the fort down upon us, it was ſo exceedingly rocked; and yet abroad we could have no ſhelter, nor were able to ſtand againſt it. The repairing of the damage will neceſſarily require a great charge, which at firſt we thought would have amounted to 3000 pagothes; but hope it will come ſhort thereof.

CAPTAIN *Brookehaven* told me, that about the iſland *Mauricius*, hurricanes were the moſt frequent of any place he knows; and that near that iſland he met with one which laſted four days in all: in one of which days the ſtorm had ſeven paroxyſms or exacerbations, which the ſeamen call frights of weather, each of which he obſerved to differ two points of the compaſs from the preceding, by which means the ſurface of the ſea, by the colliſion of the waves, became to be all white, as if the ſhip had been among rocks. He added, that the ſtorm made the day exceeding dark; and that the noiſe was rather like that of thunder, than of wind, inſomuch that thoſe on the ſhrowds could not hear thoſe on the deck.

A LEARNED phyſician, that travelled into *America*, affirmed to me, that thoſe countries only have conſtant winds from the land in the night, which are furniſhed with hills; and therefore the *Barbadoes* wants ſuch winds, becauſe it has no hills.

One of the Eaſt-Indian committee, (who had lived years in the iſland of *Teneriff*) anſwered me, that he uſually obſerved there the breezes to come in from the ſea about nine of the clock in the morning, and that about two hours after ſun-ſet, there blew a ſharp land wind, every way from the iſland to the ſeaward, which continued all night till the next morning.

A LEARNED traveller anſwered me, that though the air were generally calm and clear at the top of the mountains, yet ſometimes he had met there with winds conſiderably ſtrong.

In lettere di Venetia.

MARTEDI ſui li 29 Agoſto 1679. alle hore 19, incirca ſi leuolevò nelle paludi della villa di Fauis del dominio Ceſareo tre miglia lontana da Palma Nova dominio Veneto un vento chiamato Biſſa Boua, che allargandoſi per circa cinquanta paſſi ſcorſe con tanto empito, è furore, che portò per aria diverſi huomini, che tagliavano il fieno in quei prati, è anco alcuni carri carichi di fieno con i buoui precipitandoli aſſai lontano con la rouina delli animali, de carri, è degli huomini, è paſſando per i campi ſbarbicando ogni ſorte di piante le portò per aria gettandole molti paſſi lontano, rendendo la terra per oue ſcorſe coſi arſa, che pare non vi ſii mai ſtata piantata coſa alcuna. Arrivò nella villa detta Bagnaria del dominio Veneto doue gettò à terra molte caſe ſino à fondamenti, et altre diſcoperſe, è rouinò portando per ari atavole, travi, et ogni altra coſa che era dentro eſſe caſe reſtando mal trattate molte perſone ſenza però la morte di alcuno. Fuori di dettata villa vi è una chieſa chiamata S. Tomaſo, la quale reſto ſcoperta, è rouinata una parte del muro portando via il campanile, è campane che nel giorno ſeguente non ſi erano per anco trovate;— di là ſi portò verſo Seuigliano dominio Veneto, è rouinò tutta la campagna ſenza danno però della villa, mentre li paſsò poco lontano, è girando poco lungi dalla villa ſteſſa ſpiantò da fondamenti un palazzo del d. co. Horatio Straſoldo, nel quale gli amazzò ogni ſorte di animali che vi erano, portando per aria li mobili è ſino le botti, eſterminando parte della poſſeſſione. Non reſtorono però offeſe perſone, perche erano alla campagna à lavorare, è nel camino getto pure à terra due altre caſe che ſono nel taglio per andare à Straſoldo ſpiantendole affatto con la morte di una donna, d'un fanciullo, è diverſi animali.

Di là voltò verſo Palma, et arrivando ſino alle mura della fortezza giò verſo la villa di Privano mezo miglio diſtante quale rouinò la meta, ſpiantando da fondamenti beliſſimi palazzi, portando per aeria travi, tavole, et ogni altra coſa con la morte di molti, quantità di feriti, è diverſi ſtrapazzati con far alla campagna di molto male. Di poi ſcorſe nella villa di Viſco dominio Imperiale, è tra li altri danni fatti rouinò tutto il palazzo novo del D. Marco Foſcolini gentilhuomo di Cinidal, nel quale eſſendoni una gran remiſſa da Carozze, la di cui porta havena tre Cadenazzi, & entrando il turbine per li balconi gettò la carozza con tanto empito nella porta ſteſſa che la ruppe, è portò fuori la carozza tutta fracaſſata gettandola ſopra un muro della corte aſſai alto, portando il cielo della ſteſſa mezzo miglio lontano, è vertò nel medeno palazzo ferito, è mel trattato un ſervitore di eſſo foſcolini, di cui rouino pure una braida, & un brolo eſſendo in detta villa reſtati due morti, è diverſi feriti;— s' inoltrò poi nella villa di S. Vido di Crauglio ſtato Imperiale, la quale rouino tutta affatto ſenza reſtarvi nemeno una caſa, portando per aria coppi, travi, legne, ſaſſi, è mobili con la morte di moltiſſime perſone, è moltiſſimi feriti è rouinati, et in detta villa non ſi può andare, ne con carri, ne con cavalli per la grande moltitudine di rouinazzo, arbori et altro che hanno attraver-ſato le ſtrade, eſſendo rimaſſi morti gran numero di animali—.

Da queſto luoco ſi portò verſo villes villa Imperiale buona parte della quale gettò à terra per andar al territorio di Monfalcone con la morte di molte perſone, et quantità di animali con laſciar le campagne per dove è paſſata ſenza piante, è come ſtrada battuta———.

Hà danneggiato anco altre ville, ma leggiermenre, ne per anco ſi sà quello haverà fatto piu avanti nel detto territorio.

Queſto ſucceſſo hà laſciato un ſpavento grande in queſte parti, eſſendoſi vedute coſe incredibili mentre pioveuano ſaſſi, tavole, arbori, travi, coppi, huomini, donne, fanciulli, botti, ſorghi, uva, galline, animali, et in concluſione ciò che incontrava portava per aria con un rumore, è fracaſſo così gradne, che faceva terrore, eſſendo per dette ville un concorſo grande di popolo vicino per vedere coſe che, ſi rendono incredibili.

Doctor *B.* anſwered me, that though the eaſtern winds blew near ⅓ of a year at *Tangier*, yet they ſeem not to reach far into the inland country, where he obſerved them to be very unfrequent.

An ingenious gentleman, who is owner of a mine or two near the ſea, being aſked by me, whether he could by any peculiar change appearing in the deeper parts of the mines, foretel any alterations of weather? he anſwered me, that the only preſage he had conſtantly obſerved, was of the change of the wind. For many hours before the wind was to ſhift from ſome other corner, and get into the ſouth, the water at the bottom of the mine would appear manifeſtly more troubled, or leſs limpid than before: and when the wind was to blow from the eaſt, he was uſually forewarned of it by an unuſual degree of clearneſs in the waters, which would appear more diaphanous than ordinary, though the ſouth wind had not immediately before operated on the waters. The depth of the mine was between fifteen and twenty fathom.

He told me, that the hurricanes about *Goa* are obſerved to come uſually but at two ſeaſons, about the beginning of *March*, and the 4th of *October*.

TITLE XVI.

Of the air as the medium of ſounds, and of ſounds and noiſes in the air, and particularly thunder; and of the air's operation on the ſounds of bodies.

THIS variety of the air is the cauſe of moſt dreadful thunders; which when *Gregory* deſcribed, he aſtoniſhed his hearers. For upon the riſing of ſeveral tempeſts all together, the ſky is of a ſudden covered over with black and thick, as it were, globes of ſmoky clouds: by and by the thunder breaks forth on every ſide, rattling continually with lightning, as inceſſantly flaſhing, enough to amaze the moſt reſolute and moſt accuſtomed to the noiſe. *Ludolph's Hiſt. of Ethiop.* L. I. c. 5.

The ſtring of a viol has been by Mr. *F.* obſerved to give a ſharper ſound againſt or in rainy weather, by almoſt half a note.

Mr. *F.* alſo aſſures me, that more than once or twice it has happened to him, that having put up falſe ſtrings in his pocket, to make frets of, as judging them uſeleſs for any other purpoſe, the want of ſtrings having driven him to make uſe of thoſe, he has found them not falſe any more, but good ſtrings. And alſo that he obſerves ſome ſtrings apter to receive a tenſion from the moiſt air, than others are.

TITLE XVII.

Of the weight of the air.

A ſhort account of the ſtatical baroſcope, imparted by Mr. Boyle, *March* 24, 1665. *In a letter to Mr.* H. Oldenburgh.

AS for the new kind of baroſcopes, which not long ago * I intimated to you, that my haſte would not permit to give you an account of, ſince your letters acquaint me, that you ſtill deſign a communicating to the curious as much information as may be, in reference to baroſcopes, I ſhall venture to ſend you ſome account of what I did not name (in my former letter) to you.

Though by a paſſage you may meet with in the 19th and 20th papes of my *Thermometrical Experiments and Thoughts*, you may find, that I did ſome years ago think upon this new kind of baroſcope; yet the changes of the atmoſphere's weights not happening to be then ſuch as I wiſhed, and being unwilling to deprive myſelf of all other uſe of the exacteſt balance †, that I (or perhaps any man) ever had, I confeſs to you, that ſucceſſive avocations put this attempt for two or three years out of my thoughts; till afterwards returning to a place, where I chanced to find two or three pair of ſcales I had left there, the ſight of them brought it into my mind; and though I were then unable to procure exacter, yet my deſire to make the experiment ſome amends for ſo long a neglect, put me upon conſidering, that if I provided a glaſs bubble, more than ordinary large and light, even ſuch balances as thoſe might in ſome meaſure perform what I had tried with the ſtrangely nice ones above-mentioned.

I caused then to be blown at the flame of a lamp ſome glaſs bubbles as large, thin, and light, as I could then procure; and chooſing among them one, that ſeemed the leaſt unfit for my turn, I counterpoiſed it in a pair of ſcales, that would loſe their æquilibrium with about the 30th part of a grain, and were ſuſpended at a frame. I placed both the balance and the frame by a good baroſcope, from whence I might learn the preſent weight of the atmoſphere. Then leaving theſe inſtruments together, though the ſcales being no nicer than I have expreſſed, were not able to ſhew me all the variations of the air's weight, that appeared in the mercurial baroſcope; yet they did what I expected, by ſhewing me variations no greater than altered the height of quickſilver half a quarter of an inch, and perhaps much ſmaller than thoſe: nor did I doubt, that if I had had either tender ſcales, or the means of ſupplying the experiment with convenient accommodations, I ſhould have diſcerned far ſmaller alterations

* See number 11. p. 185. of the Philoſophical Tranſactions.

† The ſcales here meant were before competent eye-witneſſes made to turn manifeſtly with the thouſandth part of a grain.

of

of the weight of the air, ſince I had the pleaſure to ſee the bubble ſometimes in an æquilibrium with the counterpoiſe; ſometimes, when the atmoſphere was high, preponderate ſo manifeſtly, that the ſcales being gently ſtirred, the cock would play altogether on that ſide at which the bubble was hung; and at other times (when the air was heavier) that which was at the firſt but the counterpoiſe, would preponderate, and upon the motion of the balance, make the cock vibrate altogether on its ſide. And this would continue ſometimes many days together, if the air ſo long retained the ſame meaſure of gravity; and then (upon other changes) the bubble would regain an æquilibrium, or a preponderance; ſo that I had oftentimes the ſatisfaction, by looking firſt upon the ſtatical baroſcope (as for diſtinction's ſake it may be called) to foretel, whether in the mercurial baroſcope the liquor were high or low. Which obſervations, though they hold as well in winter, and ſeveral times in ſummer, (for I was often abſent during that ſeaſon) as the ſpring, yet the frequency of their viciſſitudes (which perhaps was but accidental) made them more pleaſant in the latter of theſe ſeaſons.

So that the matter of fact having been made out by variety of repeated obſervations, and by ſometimes comparing ſeveral of thoſe new baroſcopes together, I ſhall add ſome of theſe notes about this inſtrument, which readily occur to my memory, reſerving the reſt till another opportunity.

And firſt, if the ground, on which I went in framing this baroſcope, be demanded, the anſwer in ſhort may be, 1. That though the glaſs bubble, and the glaſs counterpoiſe, at the time of their firſt being weighed, be in the air, wherein they both are weighed, exactly of the ſame weight, yet they are nothing near of the ſame bulk; the bubble, by reaſon of its capacious cavity (which contains nothing but air, or ſomething that weighs leſs than air) being perhaps a hundred or two hundred times (for I have not conveniency to meaſure them) bigger than the metalline counterpoiſe. 2. That according to a hydroſtatical law (which you know I have lately had occaſion to make out) if two bodies of equal gravity, but unequal bulk, come to be weighed in another medium, they will be no longer equiponderant; but if the new medium be heavier, the greater body, as being lighter in ſpecie, will loſe more of its weight, than the leſſer and more compact; but if the new medium be lighter than the firſt, then the bigger body will outweigh the leſſer: and this diſparity ariſing from the change of mediums, will be ſo much the greater, by how much the greater inequality of bulk there is between the bodies formerly equiponderant. 3. That laying theſe two together, I conſidered, that it would be all one as to the effect to be produced, whether the bodies were weighed in mediums of differing gravity, or in the ſame medium, in caſe its (ſpecifick) gravity were conſiderably altered: and conſequently, that ſince it appeared by the baroſcope, that the weight of the air was ſometimes heavier, and ſometimes lighter, the alterations of it, in point of gravity, from the weight it was of at firſt counterpoiſing of the bubble of it, would unequally affect ſo large and hollow a body as the bubble, and ſo ſmall and denſe a one as a metalline weight: and when the air by an increaſe of gravity ſhould become a heavier medium than before, it would buoy up the glaſs more than the counterpoiſe; and if it grew lighter than it was at firſt, would ſuffer the former to preponderate: (the illuſtrations and proof can ſcarce be added in few words; but, if it be deſired, I may, God permitting, ſend you them at my next leiſure.) And though our Engliſh air be about a thouſand times lighter than water, the difference in weight of ſo little air, as is but equal in bulk to a bubble, ſeemed to give ſmall hopes, that it would be ſenſible upon a balance; yet by making the bubble very large and light, I ſuppoſed and found the event I have already related.

Secondly, the hermetically ſealed glaſs bubble I employed, was of the bigneſs of a ſomewhat large orange, and weighed about 1 drachm and 10 grains. But I thought it very poſſible, if I had been better furniſhed with conveniencies (wherein I afterwards found I was not miſtaken) to make among many, that might be expected to miſcarry) ſome that might be preferable to this, either for capacity or lightneſs, or both, eſpecially if care be taken, that they be not ſealed up whilſt they are too hot. For though one would think, that it were advantageous to rarify and drive out the air as much as is poſſible, becauſe in ſuch ſealed bubbles the air itſelf (as I have elſewhere ſhewn) has a weight; yet this advantage countervails not the inconvenience of being obliged to increaſe the weight of the glaſs, which when it includes highly rarified air, if it be not ſomewhat ſtrong, will be broken by the preſſure of the external air, as I have ſufficiently tried.

Thirdly, I would have tried, whether the drineſs and moiſture of the air would in any meaſure have altered the weight of the bubble, as well as the variation of gravity produced in the atmoſphere by other cauſes; but the extraordinary conſtant abſence of frogs, kept me from making obſervations of this kind, ſave that one morning early, being told of a miſt, I ſent to ſee (being myſelf in bed) whether it made the air ſo heavy as to buoy up the bubble, but did not learn, that that miſt had any ſenſible operation on it.

Fourthly, by reaſon of the difficulties and caſualties, that may happen about the procuring and preſerving ſuch large and light bubbles, as I have been lately mentioning, it may in ſome caſes prove a convenience to be informed, that I have ſometimes, inſtead of one ſufficiently large bubble, made uſe of two, that were ſmaller. And though a ſingle bubble of competent bigneſs be much preferable, by reaſon, that a far leſs quantity and weight of glaſs is requiſite to compriſe an

equal

equal capacity, when the glaſs is blown into a ſingle bubble, than when it is divided into two; yet I found, that the employing of two inſtead of one did not ſo ill anſwer my expectations, but that they may for a need ſerve the turn inſtead of the other, than which they are more eaſier to be procured: and if the balance be ſtrong enough to bear ſo much glaſs, without being injured, by employing two or a greater number of large bubbles, the effect may be more conſpicuous, than if only a ſingle bubble (though a very good one) were employed.

THIS inſtrument may be improved by divers accommodations. As

FIRST, there may be fitted to the anſa (or checks of the balance) an arch (of a circle) divided into 15 or 20 deg. (more or leſs, according to the goodneſs of the balance) the cock reſting over-againſt theſe diviſions, may readily, and without calculation, ſhew the quantity of an angle, by which, when the ſcales propend either way, the cock declines from the perpendicular, and the beam from its horizontal parallelism.

SECONDLY, thoſe that will be ſo curious, may inſtead of the ordinary counterpoiſe (of braſs) employ one of gold, or at leaſt of lead, whereof the latter being of equal weight with braſs, is much leſs in bulk, and the former amounts not to half its bigneſs.

THIRDLY, theſe parts of the balance, that may be made of copper or braſs, without any prejudice to the exactneſs, will, by being made of one of thoſe metals, be leſs ſubject than ſteel, (which yet, if well hardned and poliſhed, may laſt a great while) to ruſt with long ſtanding.

FOURTHLY, inſtead of the ſcales, the bubble may be hung at one end of the beam, and only a counterpoiſe to it at the other, that the beam may not be burthened with unneceſſary weight.

FIFTHLY, the whole inſtrument, if placed in a ſmall frame, like a ſquare lanthorn with glaſs windows, and a hole at the top for the commerce of the internal and external air, will be more free from duſt, and irregular agitations; to the latter end of which it will otherwiſe be ſometimes incident.

SIXTHLY, this inſtrument being accommodated with a light wheel and an index, (ſuch as have been applied by the excellent Dr. *Chr. Wren* to open weather-glaſſes, and by the ingenious Mr. *Hook* to baroſcopes) may be made to ſhew much more minute variations than otherwiſe.

SEVENTHLY, and the length of the beam, and exquiſiteneſs of the balance, may eaſily, without any of the foregoing helps, (and much more with them) make the inſtrument far exacter than any of thoſe I was reduced to employ. And to theſe accommodations divers others may be ſuggeſted, by a farther conſideration of the nature of the thing, and a longer practice.

THOUGH in ſome reſpects this ſtatical baroſcope be inferior to the mercurial, yet in others it has its own advantageous conveniencies above it.

AND firſt, it confirms *ad oculum* our former doctrine, that the falling and riſing of the mercury depends upon the varying weight of the atmoſphere; ſince in this baroſcope it cannot be pretended, that a fuga vacui, or a funiculus, is the caſe of the changes we obſerve. 2. It ſhews, that not only the air has weight, but a more conſiderable one, than ſome learned men, who will allow me to have proved it has ſome weight, will admit; ſince even the variation of weight in ſo ſmall a quantity of air, as is but equal in bulk to an orange, is manifeſtly diſcoverable upon ſuch balances as are none of the niceſt. 3. This ſtatical baroſcope will oftentimes be more parable than the other; for many will find it more eaſy to procure a good pair of gold-ſcales, and a bubble or two, than a long cane ſealed, a quantity of quickſilver, and all the other requiſites of the mercurial baroſcopes; eſpecially if we compriſe the trouble and ſkill, that is requiſite to free the deſerted part of the tube from air. 4. And whereas the difficulty of removing the mercurial inſtrument has kept men from ſo much as attempting to do it, even to neighbouring places, the eſſential parts of the ſcale baroſcope (for the frame is none of them) may very eaſily in a little room be carried whither one will, without the hazard of being ſpoiled or injured. 5. There is not in ſtatical baroſcopes, as in the other, a danger of uncertainty as to the goodneſs of the inſtruments, by reaſon, that in theſe the air is, in ſome more, and in ſome leſs perfectly excluded; whereas in thoſe, that conſideration has no place. (And by the way, I have ſometimes upon this account been able to diſcover by our new baroſcope, that an eſteemed mercurial one, to which I compared it, was not well freed from air.) 6. It being, as I formerly intimated, very poſſible to diſcover hydroſtatically, both the bigneſs of the bubble, and the contents of the cavity, and the weight and dimenſions of the glaſſy ſubſtance, (which together with the included air make up the bubble) much may be diſcovered by this inſtrument as to the weight of the air, abſolute or reſpective. For when the quickſilver in the mercurial baroſcope is either very high, or very low, or at a middle ſtation between its greateſt and leaſt height, bringing the ſcale barometer to an exact æquilibrium; (with very minute diviſions of a grain) you may, by watchfully obſerving, when the mercury is riſen or fallen juſt an inch, or a fourth, or half an inch, *&c.* and putting in the like minute diviſions of a grain to the lighter ſcale, till you have again brought the balance to an exquiſite æquilibrium; you may, I ſay, determine, what known weight in the ſtatical baroſcope anſwers ſuch determinate altitudes of the aſcending and deſcending quickſilver in the mercurial. And if the balance be accommodated with a divided arch, or a wheel and index, theſe obſervations will aſſiſt you for the future to determine readily, by ſeeing the inclination of the cock, or the degree marked by the index, what pollency the bubble hath by

by the change of the atmosphere's weight, acquired or lost. Some observations of this nature I watchfully made, sometimes putting in a 64th, sometimes a 32d, sometimes a 16th, and sometimes heavier parts of a grain, to the lighter scale. But one, that knew not for what uses those little papers were, coming to a window, where my baroscopes stood, so unluckily shook them out of the scales, and confounded them, that he robbed me of the opportunity of making the nice observations I intended, though I had the satisfaction of seeing, that they were to be made. 7. By this statical instrument we may be assisted to compare the mercurial baroscopes of several places (though never so distant) and to make some estimates of the gravities of the air therein. As if, for instance, I have found by observation, that the bubble I employ, (and one may have divers bubbles of several sizes, that the one may repair any mischance, that may happen to another) weighed just a drachm, when the mercurial cylinder was at the height of 29½ inches, (which in some places I have found a moderate altitude;) and that the addition of the 16th part of a gr. is requisite to keep the bubble in an æquilibrium, when the mercury is risen an 8th, or any determinate part of an inch above the former station: when I come to another place, where there is a mercurial barometer, as well freed from air as mine (for that must be supposed) if taking out my scale instrument, it appear to weigh precisely a drachm, and the mercury in the baroscope there stand at just 29½ inches, we may conclude the gravity of the atmosphere not to be sensibly unequal in both those two places, though very distant. And though there be no baroscope there, yet if there be an additional weight, as for instance, the 16th part of a grain, requisite to be added to the bubble, to bring the scales to an æquilibrium, it will appear, that the air at the second place is at that time so much heavier, than the air of the former place was, when the mercury stood at 29½ inches.

But in making such comparisons, we must not forget to consider the situation of the several places, if we mean to make estimates, not only of the weight of the atmosphere, but of the weight and density of the air. For though the scales will shew (as has been said) whether there be a difference of weight in the atmosphere at the two places; yet, if one of them be in a vale or bottom, and the other on the top or some elevated part of a hill, it is not to be expected, that the atmosphere in this latter place should gravitate as much as the atmosphere in the former, on which a longer pillar of air does lean or weigh.

And the mention I have made of the differing situation of places, puts me in mind of something, that may prove another use of our statical baroscope, and which I had thoughts of making trial of, but was accidentally hindered from the opportunity of doing it. Namely, that by exactly poising the bubble at the foot of a high steeple or hill, and carrying it in its close frame to the top, one may, by the weight requisite to be added to counterpoise there, to bring the beam to its horizontal position, observe the difference of the weight of the air at the bottom and at the top; and in case the hill be high enough, at some intermediate stations. But how this may assist men to estimate the absolute or comparative height of mountains, and other elevated places; and of what other uses the instrument may be put to when it is duly improved; and the cautions, that may be requisite in the several cases, that shall be proposed, I must leave to more leisure, and farther consideration.

Weight of a cubick inch of water.

I caused to be made with great care, by a skilful mathematical instrument-maker, a hollow cube of brass, whose every side was as exactly as could be procured an English inch. This we carefully counterpoised in a very good pair of scales, and found it to weigh 11 drachms, 1 grain and ½ (Troy-weight:) then placing it in one of the scales as horizontally as we were able, we warily filled it with clear common water, (of the best sort of that called pump-water) till the surface of the water seemed to lye as level as we could make it, to the brims of the vessel: then weighing it carefully, we found the water alone (for the cube had been counterpoised before) to weigh to 254$\frac{7}{16}$ grains: so that in regard it is scarce possible to know, that such a vessel is so filled, as to come nearer exactness, than within a drop or two, I presume we may, without any sensible error, suppose an inch of water to weigh 256 grains, which latter number I rather chuse, because its aliquot parts make it more convenient, and it agrees well enough with some trials, that I made with solid cubes, to measure the true weight of a cubick inch of water.

This done, the vessel was well dried within, and the same scales being well counterpoised, the instrument was so too; and being placed on one of the scales as horizontally as we could, mercury (distilled to have it more pure) was warily put into it, till by degrees it had filled the vessel as to sight; but we neither expected, nor found, that it would be brought to an exact level, and exquisitely fill all the corners of the vessel. But when it seemed to be so well filled, that even a critical eye could not readily find fault with it, though the mercury appeared capable of some accession without overflowing, we weighed the quicksilver itself (for the vessel had been counterpoised before) and found it to weigh 7 ounces, 2 drachms (Troy) which falling somewhat short, (though not very much) of what the above-mentioned weight of the water required, we tried to add a little more quicksilver, without making it run over, and found the encrease of 82 grains; so that now the quicksilver weighed 7 ounces, 3 drachms, 22 grains; but it seemed when the eye was placed in a level with the brims of the vessel,

The weight of a cubick inch of quicksilver.

that it was rather a little of the higheſt, than any way depreſſed, and yet was not ſo full, but that we could add 112 grains to the former weight, without making it run over; and perhaps we might have added yet more, but I decline doing it, becauſe the laſt mentioned acceſſion ſeemed manifeſtly to make it ſo much ſwell above the brims of the veſſel. By all which it is evident, that it is ſcarce poſſible to determine preciſely, by ſuch hollow inſtruments, the true weight of a cubick inch of quickſilver. And therefore, ſince by other ways of trial, I have found the proportion of the weight of mercury to water of the ſame bulk, to be ſomewhat leſs than that of 14 to 1, I think we may, without any conſiderable inconvenience, ſuppoſe the weight of a cubick inch of quickſilver to be 3580 grains, which is near 14 times the above-mentioned weight of a cubick inch of water, and comes near enough to the ſecond or middlemoſt of the three eſtimates lately ſet down; and by the leaſt eſtimate of all it appears, that a cubick inch of quickſilver weighs $7\frac{1}{2}$ ounces troy weight, that is, 8 ounces averdupois weight: and conſequently when the quickſilver of the baroſcope, kept up by the counterpoiſe of the air 30 inches, (as I have obſerved it ſeveral times to be within a month laſt paſt) the weight of the air, that is incumbent on an inch ſquare here below, amounts to $18l.\frac{1}{2}$ troy weight; that is in averdupois weight $15l.\frac{1}{17}$.

The weight of a pillar of the atmoſphere.

As 11 to 14, or rather as 355 to 452, ſo is the area of a ſquare inſcribed in a circle to the area of the circumſcribed circle.

Hence 355 : 452 :: 1 : 1,2732394.

Hence if the ſide of an inſcribed ſquare be an inch, that multiplied by an inch renders a cubick inch for the ſolid content.

In like manner if the height of a cylinder erected on the circumſcribing circle be an inch, the ſolid content of that cylinder is 1,2732394.

Wherefore 1, and 1,2732394 multiplied by the weight of the cubick inch of any kind of metal, give the weight of a cubick inch, and of a cylindrick inch, that circumſcribes the ſame, whence an inch table for both is eaſily made by continual addition, or for any height propounded, multiplying both by the ſame.

Mr.

Mr. *Townly*'s Regiſter, if I miſremember not.

November	23	2			28. 98
	24	8			29. 54
		9 p			28. 90
	25	3¼			80
	27	9			99
	29	9			28. 97
		9 p			29. 09
October	6	9 p			28. 97
	7	9			60
	8	9			29. 05
	11	9			28. 93
		3 p			29. 01
	13	8½			28. 90
		9 p			95
	25	9 p			29. 04
	26	9 p			28. 32
	28	10 p			29. 13
January	1	9 p			28. 99
	2	9			82
	3	9			29. 08
		9 p			06
	5	10			28. 70
	6	10			29. 09
		9½ p			28. 62
	7	8			28. 99
	12	10			28. 88
		4 p			98
	16	1			29. 13
		9 p			28. 65
	17	10			14
	21	9½			29. 05
	22	4			28. 99
		9 p			94
	23	9			99
	24	11 p			29. 06
	25	9			28. 50
		9 p			29. 10
	29	9			28. 90
		9 p			71
	30	8			80
	31	9 p	30. 12		
February	1	12	22		
	2	8½	29. 97		
	15	9 p			28. 99
	16	9 p			95
	17	8			29. 10
March	2	9 p			28. 98
	4	8½			78
		9			86
	12	9			28. 80
		9 p			66
	13	8½			29. 03
1671					
April	1	6 p			28. 29
	2	6 p			78
	3	8½			29. 03
June	8	1			29. 18
		8 p			28. 86
	9	7			99
August	12	6			28. 90
September	6	8½			29. 15
	7	10½			28. 65
	8	7½			29. 05
	12	9¼			28. 98
	29	8			28. 96
		3 p			29. 08
October	30	9 p			29. 19
	1	10			28. 63
	3	8			29. 10

In all thoſe papers the mercury was ſtill about 12 of one inch higher than is ſet down, for the numbers ſignify only bottom of the cap.

A Regiſter kept by Mr. *Locke* in *Oxford.*

		d	h	Th.	Bar.	Hy.	Wind.	Weather at *Oxford.*
1666.	*June*	24	9	70	29		N E 2	Fair.
			22	76	29 1			Fair.
		25	4	73	29 1		N E 1	Fair.
			10	74	29 1		E 1	Fair.
			15	77	29 1		S E 2	Fair.
		26	9	73	28 8		N 1	Fair.
			12	75	28 7		N E 1	Thunder.
			13	75	28 7		S W 4	Thunder, Rain, Hail.
			14	74	28 8		N 4	Thunder, Rain.
			18	73	28 8		N 1	Clouds, dry.
			22	72	28 8			Fair.
		27	7	70	28 8		N W 1	Rain.
			9	70	28 2		N W 1	Rain.
			16	68	28 8		W 1	Fair.
		28	9	63	29 1		W 0	Clouds.
			17	67	29 1		N 1	Clouds.
		29	9	63	29 2		N 1	Clouds.
			19	69	29 1		N 1	Clouds.
		30	9	64	29 2		N 0	Clouds.
			20	64	29 2		N 1	Fair.
	July	1	9	57	29 4		W 2	Fair.
		2	11	63	29 3		W 1	Clouds.
			21	67	29 2			Rain.
		3	9	66	29 1		W 1	Clouds.
			22	66	29 1			Clouds.
		4	11	64	28 8		W 0	Clouds.
			17	68	28 7		S E 2	Clouds.
		5	9	65	28 7		S W 2	Clouds.
			23	65	28 7		S W 2	Rain.

A Register kept by Mr. *Locke* in *Oxford.*

		d	h	Th.	Bar.	Hy.	Wind.	Weather.
1666.	*July*	6	9	63	29 1		W 1	Fair.
			16	67	29 1		S W 1	Clouds.
		7	9	67	29 1		S 2	Fair.
			23	72	28 7			Lightning.
		8	9	70	28 8		S W 2	Clouds.
		9	9	66	29 2		S W 2	Fair.
		10	9	66	29 1		S 2	Clouds.
		11	10	67	29 1		S 2	Clouds.
		12	10	66	29 2		S 2	Fair.
		13	10	66	29 3		W 1	Fair.
		14	3	75	28 8		S W 2	Clouds.
		15	9	67	29 1		S W 1	Fair.
		16	11	70	29 1		S W 2	Fair.
		17	5	71	28 8		E . 0	Clouds after Rain.
			19	71	28 8		W 1	Rain.
		18	7	62	29 2		S W 2	Fair.
			9	64	29 2		S W 2	Fair.
		19	9	65	29 3		S W 2	Cloudy.
		20	12	67	29 4		W 1	Fair.
		21	8	64	29 4		W 1	Fair.
		22	9	67	29 3		S W 1	Fair.
		23	9	67	29 2		E 1	Thunder, Rain.
			15	71	29 1		N E 1	Fair.
			17	71	29 1		E 1	Rain.
			21	69	29 2		1	Clouds, Lightning.
		24	9	67	29 2		N 1	Clouds.
		25	9	67	29 2		N 1	Clouds.

A Regiſter kept by Mr. *Locke* in *Oxford*.

		d	h	Th.	Bar.	Hy.	Wind.	Weather.
1666.	*July*	26	6	64	29 3		N 1	Cloſe.
		30	23	69	29 3	15		Fair.
		31	7	67	29 3	15	N W 0	Fair.
	Auguſt	15	10	60	29 2	20		Clouds.
		16	9	59	29 2	19	N 1	Fair.
		29	21	64	29 2	19		
		30	9	59	29 3	19	N 0	Fair.
		31	7	61	29 3	20	N E 0	Fair.
			9	61	29 3	20	N E 1	Fair.
	September	1	6	55	29 3	17	N E 1	Fair.
			9	55	29 3	17	E 2	Clouds.
		2	9	52	29 3	16	E 3	Clouds.
		3	9	49	29 4	16	E 2	Fair.
		4	9	47	29 3	15	E 1	Fair.
			13	50	29 3	15	E 2	Dim reddiſh Sun-ſhine *.
			20	51	29 2	14		

* This unuſual colour of the air, which, without a cloud appearing, made the ſun-beams of a ſtrange red dim light, was very remarkable. We had then heard nothing of the fire of *London*: but it appeared afterwards to be the ſmoke of *London* then burning, which driven this way by an eaſterly wind cauſed this odd phænomenon.

d	h	Th.	Bar.	Hy.	Wind.	Weather.
5	22	49	29 1			
6	9	44	29 2	15	N E 1	Fair.
8	9	44	29 4	15	N E 1	Fair.
9	9	46	29 4		S W 1	Thick, Sun.
	17	52	29 2	18	S 2	Rain.
	22	53	29 —	20	2	Rain.
10	9	52	28 8	20	S W 3	Fair.
	16	56	28 8	20	W 2	Rain.
11	11	53	28 8	22	S W 2	Cloudy.

A Register kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1666. *September*	12	9	52	29 –	23	S 3	Close.
	13	9	50	29 2	23	W 2	Fair.
	14	9	53	29 1	23	S E 2	Fair.
	15	10	57	29 1	27	N E 1	Close.
		11	57	29 1	28	N E 1	Rain.
		23	61	29 1	35		Fair.
	16	9	59	28 8	34	E —	Mist.
		21	61	28 7	37		Rain.
	17	9	54	28 8	35	N W 1	Close.
		22	49	28 1	30		Rain.
	18	9	42	28 8	37	N E 4	Close after Rain.
		11	43	29 1	36	E N 3	Close.
		13	44	29 2	35	E N 3	Close.
		17	45	29 3	35	E 2	Fair.
		23	45	29 4	35	— 0	Fair.
	19	9	41	29 5	35	N 1	Fair.
	20	9	46	29 4	37	N 1	Close.
	21	8	47	29 3	36	— 0	Thick Mist.
		22	52	29 4	38	0	Fog.
	22	10	84	29 4	37	S W 1	Close.
	23	9	46	29 5	37	W 0	Clouds.
	24	8	49	29 4	38	S W 1	Fair.
		21	55	29 2	39	— 2	Fair, h. 19 few drops.
	25	6	53	29 1	38	S 1	Clouds.
		10	54	28 8	39	S 3	Rain.
		21	50	29 1	38	0	Fair.
	26	8	49	28 7	39	W 3	Close.
	27	9	48	29 2	37	W 3	Fair.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1666. *September*		23	48	29. 4	36	2	Fair.
	28	7	45	29 5	36	W 2	Fair.
		19	47	29 4	37	2	Rain.
	29	7	51	29 4	40	W N 1	Rain.
		12	53	29 5	38	W N 2	Fair.
		18	53	29 5	35	N W o.	Fair.
	30	9	48	29 6	37	W S o	Clouds.
		21	57	29 5	46	2	Fair.
October	1	8	54	29 5	45	S 1	Clouds.
		19	61	29 5	43	o	Fair.
	2	9	56	29 5	44	S W 2	Cloſe.
	3	7	54	29 5		S W o	Cloſe.
November	25	10	32	29 1			
	26	9	31	29 2		o	Thich Fog.
		18	31	29 1		o	Fog.
	27	11	33	29 1		W o	Fair.
		18	34	29 2		o	Clouds.
		22	34	29 2		2	Clouds.
	28	10	39	28 7	63	S W 2	Rain.
		21	36	28 7	62	2	Fair.
	30	9	31	28 7	60	W S 2	Fair.
		22	31	29 1	61		Fair.
December	1	9	29	29 3	61	W o	Fair.
		22	29	29 4	61	o	Fair.
	2	9	27	29 2	60	S E 2	Clouds, Thaw.
	3	9	27	28 7	60	E 1	Clouds.
		17	27	29 7	61	o	Rain.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.		Weather.
1666. *December*	4	9	26	28 8	60	S E	0	Thick Fog.
		12	26	28 8	61	S	1	Snow.
	5	9	30	28 6	63	S	1	Hard Rain.
		21	34	28 6	63		2	Fair.
	6	9	34	29 1	64	W S	1	Fair.
		18	36	29 1	64		0	Small Rain.
	7	9	32	29 3	63	W	0	Fair.
	8	9	32	29 3	65	W S	3	Small Rain.
		23	35	29 3	64		0	Rain hard.
	9	9	31	29 1	63	N	2	Hard Snow.
		17	29	29 1	63		0	Fair.
	10	21	26	29 5	63			Fair.
	11	9	24	29 5	63	WN	1	Hard Froſt, Fair.
		21	21	29 5	60		2	Fair.
	12	9	20	29 6	59	N	1	Fair, hard Froſt.
	13	10	21	29 6	61	N	1	Fair, hard Froſt.
	14	9	22	29 6	63	NW	1	Little Miſt, and ſlow Thaw.
		11	24	29 5	63	NW	2	Clouds, Thaw.
	15	9	25	29 6	64	N	1	Fair, little Thaw.
	16	9	24	29 6	63	N E	0	Fog, hoar Froſt.
		17	24	29 6	63	N E	0	Thaw, Clouds.
	17	9	22	29 6	63	N	0	Clouds, hard Froſt.
		22	23	29 5	64			Thaw, Clouds.
	18	10	24	29 5	65	N	2	Small miſty Rain.
		21	24	29 5	64			Small Rain.
	19	9	23	29 5	64	N W		Small Snow, Thaw.
	20	9	23	29 5	64	N	2	Miſt, Thaw.
		22	22	29 5	64		0	Fair, freeze.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1666. *December*	21	10	20	29 3	63	S W 2	Hard Froſt, Clouds.
		21	22	29 2	63	1	Snow.
	22	9	22	29 2	63	N W	Clouds, no Thaw.
		22	21	29 2	63		Froſt, fair.
	23	8	21	29 1	64	N 0	Little Snow laſt Night, Froſt, cloſe.
		21	20	29 3	63	0	Fair, hard Froſt.
	24	10	17	29 4	62	N W 2	Fair, hard Froſt.
		17	18	29 3	63	W 1	Snow.
	25	9	18	29 4	62	N W 1	Hard Froſt, fair.
		22	19	29 4	61		Fair, hard Froſt.
	26	9	18	29 3	62	W 1	Fair, hard Froſt.
		19	22	29 2	63	0	Clouds, Thaw.
	27	8	22	29 2	64	N W 1	Fog.
		16	22	29 2	63	N W 1	Cloſe, Thaw.
		21	22	29 2	63	N W 0	Cloſe, freeze.
	28	9	20	29 3	63	N W 0	Cloſe, Froſt.
		22	18	29 3	63	N W 0	Cloſe, Froſt.
	29	10	16	29 4	63	N W 0	Fog, hard Froſt.
		22	15	29 5	62	0	Thick Fog, hard Froſt.
	30	9	15	29 4	62	N W 0	Very thick Fog, and hard Froſt.
		22	15	29 4	62	N W 0	Clear, hard Froſt.
	31	8	14	29 4	62	N W 0	Fair, hard Froſt.
		15	15	29 5	63	N W 0	Fair, hard Froſt.
1667. *January*	1	8	12	29 4	62	N W 0	Fog, hard Froſt.
	2	10	13	29 6	63	S E 0	Fair, hard Froſt.
	3	9	10	29 5	63	S E 0	Fair, hard Froſt.
		22	11	29 3	63	0	Cloſe, hard Froſt.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1667. *January*	4	10	13	29 3	63	E S 1	Cloſe, hard Froſt.
	5	11	12	29 2	62	E 0	Snow, Froſt.
	6	9	13	28 8	63	E S 0	Snow, Froſt.
		15	14	28 7	63	E 0	Cloſe, Froſt.
	7	9	16	28 6	64	E 0	Cloſe, hard Froſt.
		17	18	28 6	64	E 0	Little dewy rain, and tendency to a Thaw.
	8	8	20	28 6	65	E N 0	Cloſe, Thaw, little Rain.
		21	21	28 8	64	0	Cloſe, Thaw.
	9	8	21	29 2	65	E N 0	Little Snow, and little Thaw.
		21	22	29 3	65	0	Cloſe.
	10	9	21	29 3	65	N E 0	Cloſe, Froſt.
		22	21	29 2	65	2	Cloſe.
	11	8	20	29 2	65	N E 1	Cloſe, Froſt.
		12	21	29 2	65	N E 0	Cloſe, gentle Thaw.
	12	9	21	29 2	64	N E 0	Cloſe, Froſt.
	13	11	22	28 7	65	N E 0	Thick Fog, Thaw.
		22	23	28 8	65	0	Cloſe, great Thaw.
	14	8	24	28 7	65	E 1	Fog, perfect Thaw.
		21	24	28 6	65	2	Cloſe.
	15	10	22	28 6	64	E N 2	Cloſe, Froſt.
		22	23	28 6	65	0	Small Rain.
	16	8	23	28 7	65	E S 1	Cloſe.
	17	8	25	28 7	65	E N 0	Fog.
	18	7	25	28 6	65	N E 2	Snow, Thaw.
		21	23	28 8	64	2	Little Snow.
	19	8	21	29 2	64	N E 0	Froſt, little Snow.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1667. *January*		22	20	29 4	64		Hard Froſt.
	20	9	18	29 5	63	N 0	Fair, hard Froſt.
		22	20	29 6	63	0	Fair, Froſt.
	21	8	18	29 6	63	N W 0	Fair, hard Froſt.
		17	21	29 6	63	W 1	Fair, Froſt.
	22	9	25	29 5	66	S W 2	Rain.
		23	28	29 3	66	3	Rain.
	23	9	29	29 3	67	W S 1	Clouds.
		17	32	29 4	67	W 1	Fair.
	24	9	29	29 5	66	W S 1	Fair.
		21	32	29 3	66	4	Cloſe.
		23	33	29 2	66	4	Cloſe.
	25	8	36	28 8	67	S W 3	Little miſty Rain.
		19	42	28 6	73	3	Little miſty Rain.
	26	8	38	28 8	72	W S 2	Cloſe.
		12	37	28 8	73	W S 1	Rain.
	27	10	33	29 2	70	W S 2	Fair.
	28	22	30	29 2	69	1	Rain.
	29	6	30	29 2	70	1	Miſt.
		16	31	29 3	70	NW 0	Clouds.
	31	13	26	29 4	69	E 2	Cloſe.
February	1	9	26	29 5	69	E 2	Cloſe.
	2	9	28	29 5	70	E 1	Cloſe.
	3	9	31	29 5	72	S E 0	Thick Fog.
	4	9	33	29 4	72	E 0	Fog.
		22	34	29 6	73	0	Cloſe.
	5	8	32	29 7	72	E 1	Cloſe.

A Register kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1667. *February*		22	31	29.7	71	2	Close.
	6	18	26	29.7	68	NE 1	Clouds.
	7	9	24	29.5	69	NE 1	Clouds, Snow in the Night.
		23	23	29.5	67	1	Close.
	8	10	22	29.5	67	EN 2	Frost, close.
	9	8	21	29.4	67	ES 1	Close, Frost.
		22	22	29.4	68		Snow.
	10	9	23	29.3	69	SE 1	Rain.
		16	28	29.3	71	SW 2	Misty.
		23	32	29.2	73	2	Close.
	11	9	34	29.2	73	SW 2	Misty.
		22	36	29.1	74		Close.
	12	8	35	28.7	74	SE 2	Close.
		22	37	28.4	73	2	Fair.
	13	8	34	28.4	72	SW 3	Fair.
		22	36	28.2	70	2	Close.
	14	8	34	28.4	69	WS 3	Fair.
		22	33	28.6	68		Fair.
	15	8	32	28.5	69	S 2	Rain.
		23	32	28.5	69	S 2	Fair.
	16	23	31	28.7	69	N 1	Close.
	17	9	30	28.8	69	W 1	Fog.
	18	11	32	29.4	66	NW 2	Fair.
	19	9	28	29.7	64	NW	Hoar Frost, fair.
		15	33	29.6	56	S 2	Fair.
	20	9	28	29.6	63		Fair.
	21	9	28	29.5	63	ES 1	Fair.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1667. *February*	22	8	29	29 5	62	NE 1	Cloſe.
		15	29	29 5	60	NE 1	Rain.
	23	8	27	29 5	63	NE 2	Cloſe.
	24	9	26	29 6	62	NE 2	Cloſe.
	25	10	25	29 5	62	NE 1	Snow.
	26	7	23	29 4	61	NE 1	Froſt, little Snow.
	27	8	23	29 2	61	NE 1	Cloſe, Froſt.
	28	9	21	29 1	60	NE 1	Fair, Froſt.
March	1	11	22	29 2	59	E 1	Fair, hard Froſt.
	2	10	23	29 3	60	NE 1	Clouds, Froſt.
		17	26	29 3	59	NE 1	Hail.
	3	9	24	29 4	60	NE 2	Cloſe.
		21	25	29 4	62	2	Miſty, Rain.
	4	9	25	29 4	60	NE 2	Cloſe.
	5	9	24	29 2	60	NW 2	Cloſe, about 6 ſmall ſnow.
	6	23	17	29 4	56	2	Fair, hard Froſt.
	7	9	15	29 4	55	NE 2	Fair, very hard Froſt.
		13	16	29 4	54	NE 2	Snow.
	8	8	14	29 2	54	NE 2	Very hard Froſt, *Thames* frozen, carts went over.
	9	8	18	28 8	58	NE 2	Snow hard, already deep, hard froſt.
	10	9	18	29 2	58	NE 2	Cloſe, hard Froſt.
	11	8	19	29 3	57	NE 1	Hard froſt, little ſnow.
	12	8	21	29 5	57	EN 1	Froſt.
	13	9	21	29 5	56	NE 1	Cloſe, Froſt.
	14	8	21	29 4	56	SE 2	Cloſe, Froſt.
		16	23	29 3	55	SE	Cloſe, Thaw.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	Th.	Bar.	Hy.	Wind.	Weather.
1667. *March*	15	8	23	29 2	57	E 1	Miſt, Thaw.
	16	8	27	29 1	59	S E 2	Rain.
		21	30	29 0	60	0	Fair.
	17	11	31	29 2	60	N E 1	Cloſe.
	18	8	28	29 6	61	N E 1	Fair.
		18	35	29 6	62	S 1	Fair.
	19	8	33	29 6	61	S W 1	Cloſe.
	20	6	37	29 6	61	W. 1	Fair.
	21	10	35	29 4	55	S W 2	Small rain.
		12	36	29 4	56	S W 2	Small rain.
		23	38	29 1	59	3	Cloſe.
	22	9	37	29 1	58	W 2	Fair.
	23	9	35	29 1	58	SE 1	Clouds.
		11	36	29 1	58	SE 1	Rain.
	24	9	35	29 2	58	NW 1	Clouds.
	26	7	30	29 5	50	NW 1	Fair.
	27	7	29	29 6	49	NE 1	Fair.
	28	9	28	29 5	48	NE 1	Fair.

I began to keep a regiſter of heat and cold at *London*, by a thermometer of the Royal Society's ſtandard: this thermometer I marked 2.

	d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1669. *December*	26	9	3				Extreme hard froſt.
1670. *January*	13	10	4				
		23	4				Cloſe.
	14	10	4				Cloſe.
		22	4				Mixed, *i. e.* part clouds, part clear.
	15	23	3				

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1670. *January*	16	10	2				Fair.
	17	10	2				Fair.
	18	9	2				Miſt.
	19	10	1				Miſt.
	20	1	0				Clouds.
		9	0				Cloſe, Froſt.
	21	9	1				Cloſe.
	22	23	1				Fair.
	23	9	1				Fair.
	24	9	1				Fair.
	25	9	1				Cloſe.
	26	8	0				Snow.
	27	10	0				Snow.
	28	10	0				Snow.
	29	23	0				Hard Froſt.
	30	11	0				Hard froſt.
	31	11	0				Thaw.
February	2	11	0				Froſt.
	3	10	0				Froſt.
	6	23	0				
	7	9	0				Snow.
	8	9	0				Fair.
	9	10	0				Fair.
	10	9	1				Cloſe.
	11	10	0				Fair.
	12	10	1				Thaw.
	13	9	1				Rain.
	14	9	0				Fair, Froſt.
	17	2	3				Miſt.

A Register kept by Mr. *Locke* in *London.*

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
		20	11	2				Fair.
1670.	*April*	1	10	1				Close.

I here divide the degrees of the *Gresham College* thermometer, each into 4, so that 24 is now the same that 6 was before.

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
	May	27	9	24				Fair.
		29	11	31				Fair.
			23	24				Fair.
		30	7	22				Fair.
			23	29				Fair.
	June	1	9	28				Cloudy.
1671.	*May*	29	8	20				Rain.
	June	5	8	31				Cloudy.
1672.	*January*	31	9	4			N E	Fair.
	February	1	8	5				Fair.
	June	15	16	36				Cloudy.
		16	9	33				Cloudy.
			17	37			S W 2	Fair.
		20	9	29				Cloudy.
	August	15	6	24				
		17	8	25				Close.
	October	13	9	20				
	December	23	22	20				
		27	17	18				
1673.	*January*	1	22	18				
		4	18	14				
	April	3	17	5				Snow.
	May	10	21	16			E	
	June	9	22	22			E	Rain.
		10	9	21				Cloudy.
		12	9	23				Fair.

A Regiſter kept by Mr. *Locke* in *London.*

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1673.	*June*	13	22	22				Rain.
		14	9	24				Cloſe.
		17	9	26				
		18	9	26				Cloſe.
		20	9	22				Fair.
		21	9	24				Fair.
		2	6	23				Fair.
		27	10	26				
		28	9	25				Rain.

Memorand. That from the beginning of *May*, till the end of *July*, there was ſcarce one dry day, but ſo great rains, that produced greater floods, than were known in the memory of man.

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
	July	2	9	25				
		8	10	26				
		10	8	25				Fair.
		14	17	31				Fair.
		25	22	35				
		28	12	33				Cloſe.
		30	9	24				Fair.
1674.	*March*	9	8	1			N E.	Froſt and ſnow.
		19	6	5				Snow.
		20	10	5			E N	Snow all day.
	December	25	15	11				Fair.
		27	16	11			W	Fair.
		28	15	14			W	Cloſe.
1675.	*January*	3	16	14			W	Fair.
	April	25	9	12			N E	Fair.
		26	10	12			N	Fair.
		27	12	12			E	Fair.
		28	9	12			E	Cloſe.

A Regiſter kept by Mr. *Locke* in *London*.

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1675.	*May*	2	9	16				Cloſe.
		23	15	27				Cloudy.
	June	8	22	21				Cloudy.
		9	13	21				Cloſe.
		10	14	22				Cloſe.
		13	10	22			E	Cloſe.
		14	9	17				Rain.

The thermometer marked 3 is one, which I began now to uſe at my return to *Oxford*.

		d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1681.	*March*	14	14	46	29 4		W 2	A little miſt.
		15	8	36	29 6		NW	Fair.
		16	12	45	29 5		NW 2	Little rain.
		17	7	37	29 7		E	Fog.
		18	8	33	29 7		E	Fair.
		23	11	34	28 8		NW	Cloſe.
		24	12	32	29 2		N	Cloudy.
		25	18	33	28 7		NW	Cloudy.
		26	15	32	8		N	Cloudy.
		27	13	28	29 2		N	Fair, ſnow this morning.
			14		29 2		N	Snow hard.
		28	11	29	5		N	Cloudy.
		30	7	34	5		W	Cloſe: all the foregoing week it rained in ſhowers every day.
	April	6	18	49	4		S	Very fair.
		7	9	45	5		S	Very fair.
			17	55	4		SW	Very fair.
		9	8	50	3		SW	Cloſe.
			14	50	2		SW	Rain.
		10	11	44	3		W 2	Clouds, and a little ſhower this morning.

A Regiſter kept by Mr. *Locke* in *London.*

		d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1681.	*April*	11	17	46	·5		S W 2	Fair ever ſince yeſterday.
		12	15	51	·2		S 3	Fair ſince.
		13	14	49	·3		W 2	Fair ſince.
		14	13	45	·3		S W 3	Fair ſince.
		15	17	54	·3		E N	Cloſe all day.
		16	8	45	·3		E N 1	Miſt.
			17	52	·2		E N 1	A little ſhower between 4 and 5.
		17	6	49	·2		N E 1	Thick fog, ſhowers between 6 and 7 laſt night.
		18	7	46	·2		S W 2	Fair, and clouds ſince.
	May	3	14	50	29 ·4		N E 2	Cloſe, no rain ſince *April* 18, but very hot and fair weather till yeſterday, the wind for the moſt part between N. and E.
		4	10	44	·4		N E 1	Cloſe ſince.
		5	8	37	·4		N E 1	Clouds.
		6	8	37	·2		E N 1	Fair, clouds yeſterday.
			19	46	29		W 1	Cloudy.
		7	7	41	28 ·8		WN 2	Clouds.
			11	43	·8		W 1	Rain.
			16	47	·7		W 1	Cloſe.
		8	9	41	29		N E 1	Cloudy ſince.
		9	9	42	·2		E N 1	Fair.
		10	4	47	·3		N 1	Fair ſince.
		11	9	48	·3		S E 1	Fair ſince.
			15	61	·2		S W 1	Fair ſince.
		16	11	54	·6		S W 1	Fair, a little ſhower or two ſince.
			18	65	·5		W 1	Fair ſince.
		17	8	55	·6		N W 1	Fair ſince.
		19	17	70	·2		N E 1	Fair ſince.
		20	6	6	64	·3	N E 2	Cloudy, no rain from hence till *June* 20, the drieſt ſpring, that hath been known, there having been no rain from the end of *March* to the end of *June*.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1681. *Auguſt*	2	6	65	·3	7	NW 1	Fair.
	3	11	60	·3	8	N 1	Fair.
	4	9	62	·3	9	W 1	Fair.
	5	9	62	·3	8	E 1	Fair.
	6	15	71	·1		S 1	Fair.
	7	9	68	·2	9	S 1	Fair.
		15	72	28 ·8	8	S W 2	Cloudy.
	8	8	68	·7	9	S 2	Cloſe.
		11	69	·7	9	S 2	Rain a little.
	9	9	64	·8	10	S W 1	Cloſe.
		17	66	·7	10	S 1	Rain a hard ſhower.
	10	6	62	·7	11	S W 2	Cloſe.
	11	9	62	29 ·1	11	S W 1	Cloſe.
	12	8	66	·2	17	S W 1	Miſt.
	13	9	69	28 ·8	18	S 1	Rain.
		14	72	·7	17	S W 1	Fair, clouds.
	14	8	67	·8	17	S 1	Fair.
		16	72	·6	16	S E 1	Thunder ſhower.
	16	9	69	29 ·2	17	S W 1	Rain for ¼ hour, and *then fair.*
	17	6	69	·2	16		
	18	4	67	·3	16		
February	10	12	25	29 ·5		E N 1	Cloſe, froſt.
	11	10	24	29 ·6		N E 1	Fair, ice.
	12	15	27	29 ·7		N E	Very fair.
	13	11	24	29 ·7	61	N E 1	Thick Fog.
	14	8	23	29 ·6	63	N E 1	Fair.
	15	8	29	29 ·5	65	E N 1	Cloſe.
	17	8	31	29 0	72	S 2	Cloudy, and ſome rain.

A Regiſter kept by Mr. *Locke* in *Oxford.*

		d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1682.	*February*	20	17	42	28 7	75	SE 2	Rain.
		21	8	44	28 6	75	S 2	Rainy.
		22	9	42	28 7	77	S 2	Cloſe.
		24	10	41	29 2	74	SE 1	Cloſe.
		25	15	39	28 7	75	NE 1	Rain ever ſince yeſterday in the afternoon.
		26	10	38	29 1	74	N 1	Cloſe.
		27	7	37	29 3	75	NW 1	Cloſe.
		28	10	39	29 4	73	W 1	Cloſe.
	March	1	9	42	29 3	74		Fog.
		5	16	30	29 1	67	S 1	Very fair, hard froſt in the morning.
		6	10	28	29 2	67	NE 1	Fair.
		7	11	25	29 2	65	N 2	Very fair.
		22	13	29	29 2	57	N 3	Cloudy, and a *little* ſnow.
		23	8	25	29 4	56	N 2	Cloſe, Froſt.
		24	7	29	29 4	57	W 1	Cloſe.
		25	9	36	29 2	59	N 2	Clouds.
		26	8	31	29 4	56	N 1	Cloſe.
		27	8	34	29 4	57	W 2	Fair.
			13	39	29 3	59	WN 1	A ſhower.
		28	7	35	29 4	56	NW 1	Fair.
		29	7	30	29 5	50	N	Clouds.
		30	8	30	29 5	48	NE 2	Fair.
			11	31	29 5	47	NE 3	Snow.
		31	8	30	29 6	48	NE 2	Fair.
	April	1	8	30	29 6	49	NE 2	Cloſe.
		2	9	33	29 6	50	NE 1	Cloſe.
			19	36	29 6	51	NE 1	Small miſt.
		3	7	34	29 6	51	NE 1	Small miſt.

A Regiſter kept by Mr. *Locke* in *Oxford.*

		d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1682.	*April*	4	9	34	29 6	50	NE 1	Cloſe.
		5	7	34	29 5	50	NE 1	Fog, and ſun-ſhine.
		6	9	39	29 4	49	N 1	Fair.
		7	9	39	29 5	48	N 1	Fair.
		8	8	39	29 5	44	SE 2	Fog, and ſun-ſhine.
			11	43	29 5	44	SE 2	Fair.
		9	7	40	29 3	40	SE 2	Thick Fog.
			14	41	29 1	41	S 2	Rain.
			20	43	28 7	44	S 2	Rain till paſt 6, now fair.
		10	7	43	28 6	47	SW 2	Cloſe, rain in ſhowers moſt part of the day.
		11	8	43	28 6	49	SW 2	Cloſe, rain in ſhowers moſt part of the day.
		12	7	41	28 5	48	SW 1	Cloſe, ſhower about noon.
			16	44	28 6	47	WN 1	Fair.
		13	6	37	28 8	47	SE 1	Fair.
			17	44	28 5	47	2	Rain.
		14	7	42	28 2	48	SE 2	Rain all the morning, till paſt 12.
			14	45	28 5	50	W 3	Rain, more or leſs, almoſt all the afternoon.
		15	6	40	29 1	50	SW 2	Fair.
		16	7	43	29 1	48		Fair, hard ſhower about 18.
		17	7	47	28 8	49	SE 1	Cloſe, ſhowers ſeveral times in the day.
		18	7	43	28 7	50	SE 1	Rain the greateſt part of the day.
		19	6	44	28 7	52	S 2	Cloſe, rain a great part of the day.
		20	6	44	28 6	51	SE 1	Rain, and ſo in ſhowers ſeveral times of the day.
		21	4	45	28 6	51	S 1	Cloudy, rain moſt part of the morning.
		22	8	47	28 7	51	S 1	Rain.
			17	51	28 8	52	N 1	Rain, moſt part of the afternoon.
		23	7	46	29 2	52	N 1	Cloſe.

A Regiſter kept by Mr. *Locke* in *Oxford.*

		d	h	T. 2.	Bar.	Hy.	Wind.	Weather.
1682.	*April*		13	49	29 3	52	S 1	Cloſe, rain almoſt all the afternoon.
			22	49	29 3	52	N about 18	Hard rain.
		24	6	46	29 4	52	E 1	Cloſe, hard rain at night.
		25	7	47	29 1	52	E S 1	Cloſe, ſome rain.
			14	42	28 8	53	S E 1	Dropping.
			22	54	28 7	54	3	Hard rain from 18.
		26	7	52	28 6	54	S 2	Cloſudy, rain often in the day.
		27	5	52	28 8	55	S W 1	Cloſe, a good deal of rain before night.
		28	18	51	28	55	S W 1	Cloſe, rain a good part of the morning. and ſome in the afternoon.
		29	8	47	29 1	55	S W 1	Cloudy, a little rain in the afternoon.
		30	5	47	28 8	55	S W 1	Fair.
			18	46	28 6	55	N E 1	Hard rain, which began about 11, and laſted till 21 or 22.
	May	1	4	42	28 8	55	N W 2	Cloudy.
			21	47	29 2	54	N W 1	Fair.
		2	8	43	29 2	54	S W 1	Cloudy, hard rain from 19 or 20 all night.
		3	6	49	28 7	54	S W 2	Clouds, wind W. all the afternoon, but fair, bating a *little* rain in the evening.
		4	5	52	28 7	54	S E 1	Rain hard till 13.
			13	54	28 7	53	N 1	Rain hard till night.

Memorand. That new fitting my barometer, here the mercury was raiſed by addition of more in the receiver about $\frac{2}{10}$ inch, which is almoſt 2 of my degrees, which are eights, though I ſuſpect it is ſtill, by reaſon of included air, a degree or two too low.

h	d	T. 2.	Bar.	Hy.	Wind.	Weather.
	22	53	29 2	54		Small rain.
5	8	48	29 3	54	E 1	Rain.
	20	51	29 3	55	E 1	Cloſe rain moſt part of the morning, and 2 or 3 ſhowers in the afternoon.
6	7	48	29 3	55	N E 1	Miſt.
7	8	46	29 4	55	E 2	Rain a great part of the day.
8	4	53	29 2	56	S W 2	Hard rain till 7 or 8.

An industrious young man, that, whilst he was my domestick, I bred up to chemistry, (of which he now teaches courses) related to me the other day, that toward the latter end of the last month (which was *June*) being at *Oxford*, where his house is, he had occasion to cast his eyes upon his baroscope, and was not a little surprised to find, that the quick-silver was in an extraordinary measure altered from the height it stood at but a while before: whereupon, though the weather were very hot and fair, as is usual in *June*, and had continued so for some days, yet he took upon him to foretel from this great and quick subsidence of the mercury, that there would be before long some notable change of weather. And accordingly it happened within about four or five hours, that the sky was all overcast; and there fell a hideous storm of rain, lightning, thunder, and accompanied with such a whirlwind, as scarce any remember to have seen in that city.

A letter to the author.

Honoured Sir,

I HAVE been able to do so little in the attempts I have made to serve you, that I am ashamed to have been so well furnished to so small purpose. The barometer I had from you was conveyed safe into the country, and as soon as it came to my hands, I rode to *Minedeep*, with an intention to make use of it there in one of the deepest gruffs (for so they call their pits) I could find: the deepest I could hear of was about 30 fathom, but the descent so far either from easy, safe, or perpendicular, that I was discouraged from venturing on it. They do not, as in wells, sink their pits strait down, but as the cranies of the rocks give them the easiest passage; neither are they let down by a rope, but taking the rope under their arm, by setting their hands and legs against the sides of the narrow passage, clamber up and down, which is not very easy for one not used to it, and almost impossible to carry down the barometer, both the hands being employed. This information I should have suspected to come from their fear, had not an intelligent gentleman, neighbour to the hill, assured me it was their usual way of getting up and down. For the sight of the engine, and my desire of going down into some of their gruffs, gave them terrible apprehensions; and I could not persuade them but that I had some design: so that I and a gentleman, that bore me company, had a pleasant scene, whilst their fear to be undermined by us made them disbelieve all we told them; and do what we could, they would think us craftier fellows than we were. But, Sir, I will not trouble you with the particulars of this adventure: but certain it is the women too were alarmed, and think us still either projectors or conjurers. Since I could not get down into their gruffs, I made it my business to enquire what I could concerning them: the workmen could give me very little account of any thing, but what profit made them seek after; they could apprehend no other minerals but lead ore, and believed the earth held nothing else worth seeking for: besides, they were not forward to be too communicative to one they thought they had reason to be afraid of. But at my return, calling at a gentleman's house, who lives under *Minedeep* hills, and who had sent out his son to invite me in; amongst other things he told me this, that sometimes the damps catch them, and then, if they cannot get out soon enough, they fall into a swoon, and die in it, if they are not speedily got out; and as soon as they have them above ground, they dig a hole in the earth, and there put in their faces, and cover them close up with turfs; and this is the surest remedy they have yet found to recover them. In deep pits they convey down air by the side of the gruff, in a little passage from the top; and that the air may circulate the better, they set up some turfs on the lee side of the hole, to catch, and so force down the fresh air: but if these turfs be removed to the windy side, or laid close over the mouth of the hole, those below find it immediately by want of breath, indisposition, and fainting: and if they chance to have any sweet flowers with them, they do not only lose their pleasant smell immediately, but stink as bad as carrion. Notwithstanding this ill success, I had attempted some trials once more, had not the spreading of the contagion made it less safe to venture abroad, and hastened me out of the country sooner than I intended. But I have some hopes, the next journey I make into those parts, to give you a better account than this that follows. Near the house, where I sometimes abode, was pretty steep and high hill. *April* 3. *hora inter* 8 & 9. *matutin.* the wind west, and pretty high, the day warm, the mercury was at 29 inches and $\frac{1}{8}$, being carried up to the top of the hill, it fell to 28 inches $\frac{3}{4}$, (or thereabouts, for I think it was a little above 28 inches $\frac{3}{4}$:) both going up and coming down, I observed, that proportionably as I was higher or lower on the hill, the mercury fell or rose. At my return to the bottom of the hill, the mercury wanted of ascending to its former height $\frac{1}{2}$ of inch, which I impute to the sun's rarifying some particles of air, that remained in the upper part of the tube, rather than to any other change in the air; for I find it harder to clear the tube of the air perfectly, than at first I thought, or of water, if that have been put in with the mercury, and I fear liable to the same inconvenience with air inclosed. I know this is far short of what you might have expected, and has, I fear, but little answered your desires, since I guess it was the perpendicular height of the place I made the experiment in, that you would have had, and perhaps other considerations of air, inclosed, and liable to mineral steams, would have made a trial in one of the gruffs more acceptable to you. I do not think any thing in this letter worthy of you, or fit for

the publick. But ſince I find by the two laſt Philoſophical Tranſactions, that obſervations on the Torricellian experiment are much looked after, and deſired to be compared; if for want of better, this ſhould be thought fit to fill an empty ſpace in the philoſophical newsbook, I ſhall deſire to have my name concealed. But I fear, that this very caution of being in print, where there is no danger of it, has too much of vanity in it. I am ſure it is boldneſs enough, though allayed with obedience, to venture ſuch ſlight things to your ſight. I viſited the incruſted ſpring I formerly mentioned to you, and could not find any thing incruſted within at leaſt 20 yards of the riſe of it. The place, where it works moſt, is about 40 or 50 yards from the ſpring head, and is at a fall higher than my head: there it ſheaths every thing with ſtony caſes, and makes the ſides of the bank hard rock, and from thence all along its ſtream it covers ſticks, *&c.* with a cruſt; and ſome ſo candied I found above this fall, but not ſo frequent; whether the mixing of air with the water in the fall contributes any thing to the effect, I cannot gueſs; but that the fall does, I ſuppoſe: for beſides, that at the abovementioned fall, it ſeems to operate moſt ſtrongly, I obſerved, that though I could not find any thing incruſted within a good diſtance of the ſpring, yet that the moſs above the ſpring was a little incruſted, (but not ſo firmly as at the other place) for the water in the winter, when the ſprings are full, runs out alſo at a hole two or three yards above the place, where now only it riſes, and from thence falls perpendicularly into this lower ſpring, from whence it runs by an eaſy deſcent to the next fall. A gentleman, in whoſe field it riſes, and by whoſe houſe it runs, told me upon enquiry, that he uſes it both in his kitchen and brewhouſe, without any ſenſible ill effects, he being a pretty ancient, but healthy man, and long inhabitant of that place. It will bear ſoap, freezes quickly, and waters his grounds upon occaſion, with advantage. All the ill effects of it, that he can gueſs, are, that his horſes are uſually ſhort-breathed, which he imputes to the drinking of that water. I brought with me from *Minedeep* ſome ore, and ſome ſtones; but I think them ſo inconſiderable, that I ſhall not judge them worth ſending, unleſs you pleaſe to command them. I am, Sir,

Your moſt humble, and
moſt obedient ſervant,

Ch. Ch. 5° May, 1665. JOHN LOCKE.

POSTSCRIPT.

I HAD forgot to mention to you, that in their gruffs, after burning, (when they meet with hard rocks in their way, they make a fire upon them, that they may dig through the eaſier) they find it very dangerous to go down into them, as long as there remains any fire or heat in any chinks of the rocks.

SOME days ago the king doing me the honour to diſcourſe with me about the uſe of baroſcopes, was pleaſed to ſay, among other remarkable things, that at a time his majeſty then named, he went from *Whitehall* about ſix in the morning, towards the mouth of the river, attended by divers of the nobility, and particularly by one lord then preſent, whom his majeſty put in mind of the adventure; and then he added, that though the weather were exceeding fair, and likely to continue ſo, inſomuch that ſome of the courtiers congratulated to his majeſty ſo promiſing a morning; yet when they were once gone too far to return, he told them he thought they would be much miſtaken, and that they were to prepare for a ſtorm; which conjecture his majeſty grounded upon his having, unknown to the company, conſulted a good baroſcope before he went out, and found the mercury in it to have ſuddenly, and very notably ſubſided. And accordingly within a very few hours the event verified his majeſty's prediction, a ſudden ſtorm driving on the yatch he was in for divers leagues, at a very unuſual rate.

Nous apprenons de ces experiences, que puiſque le poids de l'air et le poids de l'eau, qui eſt dans les pompes, ſe tiennent mutuellement en equilibre, ils peſent preciſement autant l'un que l'autre; & qu'ainſi en connoiſſant la hauteur, ou l'eau s'éleve en tous les lieux du monde, nous connoiſſons en meſme temps, combien chacun de ces lieux eſt preſſé par le poids de l'air, qui eſt au deſſus d'eux; et partant.

Que les lieux, qui ſont au bord de la mer, ſont preſſez par le poids de l'air, qui eſt au deſſus d'eux juſques au haut de ſa ſphere, autant preciſement, que ſi au lieu de cét air on ſubſtituoit une colomne d'eau de la hauteur de 31 pieds deux poulces.

Ceux, qui ſont plus élevez de dix toiſes, autant que s'ils portoient de l'eau de la hauteur de 31 pieds un poulce.

Ceux, qui ſont élevez au deſſus de la mer de 500 toiſes, autant que s'ils portoient de l'eau à la hauteur de 26 pieds onze poulces: & ainſi du reſte.

Nous apprenons par ces experiences, que l'air, qui eſt ſur le niveau de la mer, peſe autant que l'eau, à la hauteur de 31 pieds deux poulces; mais parce que l'air peſe moins ſur les lieux plus élevez que ſur le niveau de la mer; et qu'ainſi il ne peſe pas ſur tous les points de la terre egalement, & meſme qu'il peſe differemment par tout, on ne peut pas prendre un pied fixe, qui marque combien tous les lieux du monde ſont chargez par l'air, le fort portant le foible; mais on peut en prendre un par conjecture bien approchant du juſte; comme par exemple, on peut faire eſtat, que tous les lieux de la terre en general, conſiderez comme s'ils eſtoient également chargez d'air, le fort portant le foible, en ſont autant preſſez, que s'ils partoient de l'eau à la hauteur de 31 pieds; et il eſt certain, qu'il n'y à pas un demy pied d'eau d'erreur en cette ſuppoſition.

Or nous avons veu, que l'air, qui eſt au deſſus des montagnes hautes de 500 toiſes ſur le niveau de la mer, peſe autant que l'eau à la hauteur de 26 pieds 11 poulces.

Et

Et par conſequent tout l'air, qui s'étend de puis le niveau de la mer juſqu' au haut des montagnes, hautes de 500 toiſes, peſe autant que l'eau à la hauteur de 4 pieds un poulce, qui eſtant à peu prés la ſeptiéme partie de la hauteur entiere; il eſt viſible, que l'air compris depuis la mer juſques à ces montagnes eſt à peu pres la ſeptiéme partie de la maſſe entiere de l'air.

Nous apprenons de ces meſmes experiences, que les vapeurs, qui ſont épaiſſes dans l'air, lors qu'il en eſt le plus chargé, peſent autant que l'eau à la hauteur d'un pied huit poulces; puiſque pour les contrepeſer, elles font houſſer l'eau dans les pompes à cette hauteur, par deſſus celle, ou l'eau contrepeſoit déja la peſanteur de l'air: de ſorte que ſi toutes les vapeurs, qui ſont ſur une contrée, eſtoient reduites en eau, comme il arrive, quand elles ſe changent en pluye, elles ne pourroient produire que cette hauteur d'un pied huit poulces d'eau ſur cette contrée. Et s'il arrive par fois des orages, ou l'eau de la pluye qui tombe vienne à une plus grande hauteur; c'eſt parce que le vent y porte les vapeurs des contrées voiſines.

Nous voyons auſſi de là, que ſi toute la ſphere de l'air eſtoit preſſée & comprimée contre la terre par une force, qui la pouſſant par le haut, la reduiſiſt en bas à la moindre place qu'elle puiſſe occuper, & qu'elle la reduiſiſt comme en l'eau, elle auroit alors la hauteur de 31 pieds ſeulement.

Et par conſequent, qu'il faut conſiderer toute la maſſe de l'air en l'eſtat libre ou elle eſt, de la meſme ſorte, que ſi elle euſt eſte autrefois comme une maſſe d'eau de 31 pieds de haut à l'entour de toute la terre, qui euſt eſté rarefiée et dilatée extremement, et convertie en cet eſtat, ou nous l'appellons air, auquel elle occupe à la verite plus de place, mais auquel elle conſerve preciſement le meſme poids, que l'eau à 31 pieds de haut.

Et comme il n'y auroit rien de plus aiſé, que de ſupputer, combien l'eau, qui environneroit toute la terre à 31 pieds de haut peſeroit de livres; et qu'un enfant, qui ſcait l'addition et la ſouſtraction le pourroit faire; on trouveroit par le meſme moyen, combien tout l'air de la nature peſe de livres, puiſque c'eſt la meſme choſe; et ſi on en fait l'épreuve, on trouvera, qu'il peſe à peu prés huit millions de millions de millions de livres.

J'ay voulu avoir ce plaiſir, et j'en ay fait le compte en cette ſorte.

J'ay ſuppoſé, que le diametre d'un cercle eſt à ſa circonference, comme 7 à 22.

J'ay ſuppoſé, que le diametre d'une ſphere eſtant multiplié par la circonferehce de ſon grand cercle, le produit eſt le contenu de la ſuperficie ſpherique.

Nous ſçavons, qu'on à diviſé le tour de la terre en 360 degrez: cette diviſion à eſté voluntaire, car on l'euſt diviſée en plus ou moins, ſi on euſt voulu, auſſi bien que les cercles celeſtes.

On à trouvé, que chacun de ces degrez contient 50,000 toiſes.

Les lieues autour de Paris ſont de 2500 toiſes; et par conſequent il y à 20 lieues au degré: d'autres en comptent 25; mais auſſi ils ne mettent que 2000 toiſes à la lieue; ce qui revient à la meſme choſe.

Chaque toiſe à 6 pieds.

Un pied cube d'eau peſe 72 livres.

Cela poſé, il eſt bien aiſe de faire la ſupputation, qu'on cherche.

Car puiſque la terre à pour ſon grand cercle, ou pour ſa circonference ..... 360 *degrez.*

Elle à par conſequent tour de ..... 7200 *lieues.*

Et par la proportion de la circonference au diametre aura ..... 2291 *lieues.*

Donc en multipliant le diametre de la terre par la circonference de ſon grand cercle; ou trouvera, qu'elle à en toute ſa ſuperficie ſpherique ..... 1649200 *lieues quarrées.*

C'eſt à dire ..... 103, 095, 000, 000, 000, *toiſes quarr.*

C'eſt à dire ..... 3711, 420, 000, 000, 000, *pieds quarr.*

Et parce qu'un pied cube d'eau peſe 72 livres:

Il s'enſuit, qu'un priſme d'eau d'un pied quarré de baſe, et de 31 pieds de haut, peſe 2232 livres.

Donc ſi la terre eſtoit couverte d'eau juſques à la hauteur de 31 pieds, il y auroit autant de priſmes d'eau de 31 pieds de haut, qu'elle à de pieds quarrez en toute ſa ſurface. (Je ſcay bien, que ce ne ſeroient pas des priſmes, mais des ſecteurs de ſphere; et je neglige exprés cette preciſion.)

Et partant elle porteroit autant de 2232 livres d'eau, qu'elle à de pieds quarrez en toute ſa ſurface.

Donc cette maſſe d'eau entiere peſeroit,

8283, 889, 440, 000, 000, 000, *livres.*

Donc toute la maſſe entiere de la ſphere de l'air, qui eſt au monde, peſe meſme poids de

8283, 889, 440, 000, 000, 000, *livres.*

C'eſt à dire, huit millions de millions de millions, deux cent quatre vingt trois mille huit cent quatre vingt neuf millions de millions, quatre cent quarante mille millions de livres.

Mr. *Paſcal* in his ſmall tract, either *De la Peſanteur de l'air*; or in that *De l'Equilibre des liqueurs.*

De cætero, feci haud ita pridem experimentum ponderandi aeris, quod pulchrè ſucceſſit; nam ſumptâ vitreâ lagenâ, valde levi et ad lampadem ſufflatâ, ejus figuræ, qualem hic excuſam vides, magnitudine parvæ pilæ, quales habentur in ſphæriſteriis, non habente niſi minimam quandam aperturam, per quam immittatur pilus in extremitate orificii ſui B. ponderavi eam in bilance valde exacta, & frigida pondus habuit 78 granorum cum dimidio: poſtea calefeci eam carbonibus impoſitam, & repoſui in bilancem eo ſitu, quo hic deſcriptum vides, nimirum orificio in imum verſo, & deprehendi eam vix habere pondus 78 granorum, tum immergendo orificium in aquam, refrigeſcere feci, & dum aer ſe condenſat pro modo, quo refrigeſcit lagena, intravit tantundem aquæ, quantum aeris calor antea expulerat; denique ponderans eam cum omni illa aqua deprehendi eam habere pondus 72 granorum & dimidii plus quam antea: unde concludo aerem, qui per ignem expulſus erat, ſe habere ad aquam, quæ in locum ſuum regreſſa erat uti ½ ſe habet ad 72½, aut uti ſe habet 1. ad 145. ſed potui in eo erraſſe; difficile quippe eſt in ea re omnino exactum eſſe; id ſaltem certò ſcio, quòd pondus aeris hoc modo ſit ſenſibile, & prolixe hic deduxi proceſſum meum, ut ſi te eadem curioſitas inceſſat, poſſis id eodem modo perficere experimentum. Vale.

TITLE XVIII.

Of the consistency of the air, its rarity, density, fluidity, subtilty.

A THIN but large bladder, wherein there was about the third part of the air it was capable of containing, being strongly tied at the neck, and at the opposite part suspended and clogged at the bottom, with a weight of 14 pound, so that it rested on the floor, which sustained it; the strings, that tied the bladder, were well stretched before, and could not shrink a quarter of an inch without drawing up the weight. Then two fire-shovels, with small coals and ashes were applied at a convenient distance, and kept moving to warm and rarify the included air, without cracking the bladder; by which means, after some of the wrinkles of the bladder had been displayed, not without noise, the air being expanded, and consequently the bladder a little swelled, and the whole string shortened, the weight was raised and made to swing like a pendulum. The same experiment being tried two or three times with a quarter of an hundred, succeeded not, though with large bladders, the heat still either breaking the bladder with noise, or occasioning some little leak, which hindered the desired success; though once we came so very near it, that it is scarce to be doubted, that if we had had good accommodations, it would have succeeded well, and that perhaps if the weight had been greater.

To try whether the corpuscles of the air would dive into a liquor, that was exposed but to the ordinary pressure of the free air or atmosphere. We covered the bottom of a cylindrical vial with filings of copper, and then poured on it an urinous spirit, to the height of about three fingers breadth; and on this liquor we poured oil of almonds to the thickness of a crown piece of silver, or that of about the fifth part of an inch; then we stopped the vial well, and left it in a quiet place for several days. The event was such as we expected, namely, that the urinous liquor did then first acquire, and then lose a blue tincture, both were done but slowly. And when the colour was pretty well lost, (for the liquor was not clear, but somewhat troubled) we took out the cork, and kept the vial unstopped for one minute of an hour, and then stopped it again, that in that short time the upper part of the urinous spirit began to be tinged with blue, and within an hour, though the vessel were all the while kept stopped, the sky-colour reached to the lower part of the liquor, which at this time is wholly and deeply of that colour, the oil that swims above it being clear.

TITLE XIX.

Of the heat and coldness of the air.

THOUGH the peripatetick doctrine about the limits and temperaments of the three regions, into which they divide the air, hath been so plausibly proposed, that it has been readily entertained, not only by the Aristotelian schools, but by the generality of philosophers, as well modern as ancient: yet since I think it becomes a naturalist to consider, not so much how easy a doctrine is, by reason of its concinnity, to be remembred or supposed, as how strongly it is to be proved, I must not dissemble, that as to this vulgar theory, I think it fitter we should wish it to be true, than that we should believe it is so: for I confess, that upon the best informations I have been able to procure from travellers by land and sea, or from writers, that relate rather what they have observed, than what they have been taught, I have been much tempted to question the received doctrine of the schools about the regions of the air. And that you may judge, whether or no my thoughts be rational, the ensuing discourse shall acquaint you with several of the particulars on which they are grounded.

WHAT I have in other papers written concerning cold, does not only make it less proper for me to treat of it indefinitely in this place, but would make it difficult for me to say much on this subject without repetition. And it were perhaps fittest for me to say nothing on an occasion, wherein I have left myself little to say, that is new and pertinent; but yet since this title promises not any thing about cold in general, but only some less heeded particulars relating to the coldness of the air; that I may not leave it wholly unfurnished, I will refer to it a few instances that ensue.

THE physician elsewhere mentioned, that was lately at *Morocco*, answered me, that notwithstanding the excessive heat reigned there in the day time, he felt the night very cold, and so he did the mountainous air in those parts.

AN intelligent gentleman, that stayed a year in *Guinea*, and spent part of that time in the land, answered me, that notwithstanding the excessive heat of the climate, he was divers times, about four of the clock in the morning, reduced to be ready to tremble for cold, as he lay in his hammock, for about an hour together.

A LEARNED man, that lived at *Jamaica*, assured me, that when he laid in his hammock, about three or four foot from the ground, though he had much clothes under him, and little or none over him, he felt it cold beneath, and hot above.

IT is obvious to every man's sense or observation, that the greater heat, that is usually found in our air, during the summer, than in other seasons of the year, has manifest effects upon such easily agitable bodies as liquors, and upon the juices and flesh of animals, and the softer parts of vegetables. But that even in places sheltered from the sunbeams, the warmth of a temperate summer should be able sensibly to rarify and expand so cold and compact a body, as glass itself, would not be easily suspected or believed. And

A Regiſter kept by Mr. *Locke* in *Oxford.*

		d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1682.	*May*	9	10	54	29 1	55	E 1	Cloſe.
			14	55	29 1	55	S W 1	Rain.
		10	9	50	29 2	54	S 1	Cloudy, a little rain about 17, and again about 22.
		11	6	49	29 2	54	S W 1	Cloſe.
		11	9	50	29 2	55	S W 1	Short ſhower, ſeveral ſhort ſhowers in the afternoon.
		12	6	49	29 3	54	S W 1	Cloſe, a ſhower in the morning.
		13	4	51	29 2	53	E 1	Cloſe, ſeveral ſhowers in the day.
		14	9	53	29 4	54	S W 2	Clouds.
		15	7	51	29 4	51	S 1	Fair.
		16	8	61	29 2	48	SE 1	Fair, hard ſhower about 18.
		17	5	60	29 3	48	S W 2	Cloſe.
		18	7	57	29 5	47	W 1	Fair.
		19	8	58	29 5	45	W S 1	Fair.
		20	5	63	29 3	43	S E 1	Fair.
			16	69	29 3	43	W S 1	Very fair.
		21	8	59	29 3	44	S 1	Fair.
		22	9	69	29 1	42	S E 1	Fair.
			17	47	29 1	38	S W 2	Fair.
		23	7	64	29 2	38	W 1	Fair, gentle rain from 8 to 11.
			10	63	29 2	38	W 1	Rain.
		24	7	62	29 2	39	N 1	Cloſe.
		25	6	59	29 3	42	NW 1	Fair.
		27	9	53	29 5	42	W 1	Fair.
		28	14	67	29 3	33	S 1	Fair.
	October	14	9	45	29 6	49	W 1	Cloſe, rain laſt night.
		16	13	48	29 4	51	S W 2	Rain till bed-time.
		17	9	47	29 2	51	W 1	Fair, little rain.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1682. *October*	18	10	41	29 1	51	S W 2	Cloudy, hard rain from 5 to bed-time.
	19	9	39	28 7	51	W 1	Fair, ſhower in the afternoon.
	20	9	34	28 7	51	0	Rain.
	27	22	38	29 7	60		Cloſe.
	28	10	37	29 7	60	E N 2	Fair.
November	8	18		29 8			Fair, hard froſt.
	9	9	22	29 8	57	N 1	Fog, gone before noon; hard froſt.
	10	10	26	29 8	58	E N 1	Fair, hard froſt.
	11	9	25	29 7	56	N E 1	Cloſe, hard froſt.
	12						Fair, hard froſt.
	13	10	26	29 5	57	N E 1	Cloſe, hard froſt.
	14	13	23	29 7	57		Thick fog, fair in the afternoon.
	15	10	36	29 4	56	S W 1	Cloſe, rain this morning, hard rain 22.
	16	5	41	29 1	66		Hard rain, rain moſt part of the day.
		17	41	29 1	65	S W 1	Rain.
	17	11	39	29 1	64	W S 2	Fair.
	18	9	37	28 7	64	0	Fog, rain moſt part of the day.
	19	9	33	29 1	62	W 1	Fair, rain in the night.
	20	10	40	29 1	64	W N 1	Fair, rain in the afternoon.
		22	42	29 2	63	2	Fair.
	21	6	42	29 1	64		Hard rain till 10.
		16	43	29 2	64	W 2	Fair.
	22	11	33	29 5	63	W 1	Small fog, froſt this morning.
	23	9	28	29 5	62	N W	Fog, thick fog all day.
	24	9	25	29 5	62	N W	Thick fog, little rain in the evening.
	25	8	35	29 3	67	S W 1	Cloſe, rain in the evening.
	26	9	35	29 4	65	W N 1	Fair.
	27	10	31	29 7	64	W N 1	Fair.
	28	4	32	29 8	65		Fair.

A Regiſter kept by Mr. *Locke* in *Oxford.*

	d	h	T. 3.	Bar.	Hy.	Wind.	Weather.
1682. *November*	29	8	33	29 ·7	65	W S	Small fog.
	30	9	35	29 ·7	65	S W 1	Fair.
December	1	8	35	29 ·6	66	S 1	Miſt.
	2	9	34	29 ·6	66	S 1	Cloſe.
	3	9	34	29 ·6	66	S W 1	Foggy.
1683. *June*	21	9	62	29 ·3	46	W 1	Cloſe.
	22	8	65	29 ·2	48	W S 2	Cloſe, ſome ſhowers.
	23	7	59	29 ·4	46	W 1	Cloudy.
	25	19	67	29 ·4	44	W N 1	Fair, miſt in the morning.
	26	10	64	29 ·5	43	S 1	Very fair.
		17	72	29 ·3	43	S W 2	Fair.
	30	13	62	29 ·3	37	W N 3	Fair.

An Explication of the foregoing Regiſter.

THE firſt column with *d.* at the top, contains the day of the month.

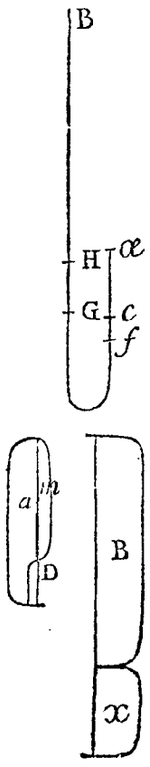
THE ſecond column, with *h.* at the top, contains the hour of the day, which beginning from midnight, I count to 24, which is midnight again; ſo that 13 ſtands for 1 afternoon, and ſo on.

THE third column, with *Th.* at the top, marks the degrees of my thermoſcope, which having been blown up at a lamp, though the ſpaces of the degrees were equally divided, yet becauſe of the unequal bigneſs of the ſmall tube, towards the extremities, where it grew bigger, it did not always in every degree mark equally proportionable degrees of heat and cold. The points to be obſerved in that and the next column, which is that for the baroſcope, ſhew the juſt place, where the top of the tinged ſpirit of wine in the one, and the mercury in the other, ſtood between the line of the degree marked, and the following, when the obſervation was made. The thermoſcope I made uſe of till *December*, 1669, was a ſealed one, with all the degrees encreaſing with the heat in one continued ſeries. The thermoſcope, which I uſed from *December* 1669, to *June* 1675, and is marked 2, was one of Mr. *Cotgrave*'s adjuſting, which beginning the reckoning from the temper of freezing, hath the numbers increaſing both upwards and downwards; the points ſhew it to be in the degrees, above 0, if ſet over, and under 0, if ſet under: and ··· or ··· ſhew it higher or lower in each degree. The thermoſcope uſed from *March* 1681, to the end, is marked 3, and is of the kind of that uſed firſt.

THE column having *Hy.* at the top, contains the degrees of moiſture, as marked by an hygroſcope made of the beard of a wild oat.

IN the column of the wind, I not having the convenience to obſerve the points exactly, have marked but 8, but yet with this variety, that where I ſet two letters, the wind was moſt from that point whoſe letter ſtands firſt, *v. g.* W. N. ſignifies more weſt than north. When I ſet only one letter, it was in or very near that cardinal point.

THE ſtrength is marked by 0, 1, 2, 3, 4. 0 ſignifies not ſo much wind, that moved any leaf that I could ſee in a garden I looked into out of my window, but the letter joined to it ſignifies which way the weather-cock then ſtood, whether the former wind left it ſo, or the preſent breeze blew that way. 1 ſignifies a gentle gale, juſt perceivable by the moving of the leaves or plants. 4 ſignifies a very violent ſtorm: 2 and 3 the ſeveral degrees between 1 and 4, as well as I could judge. Theſe degrees, though not ſo exactly meaſured as I could have wiſhed, I yet thought better than nothing.



LE tuyau recourbé eſtoit fermé au bout æ et ouvert à l'autre extremité B. *la recourbure depuis.* G. *juſq' à* C. *eſtoit pleine de mercure, & tout le reſte eſtoit plein d'air. La longueur* Æ. C. *eſtoit* 4 *pouces ou* $2\frac{3}{8}$. *J'echauffay cet air, et il fait baiſſer le mercure juſques en* f. *qui eſtoit* $\frac{3}{8}$ *plus bas, & en meſme temps il monta juſq' en* H. *qui eſtoit* $\frac{5}{8}$ *plus haut que* G. *ou* C.

Pour ſçavoir quélle hauteur de mercure auroit eſte neceſſaire pour empeſcher la dilatation de l'air, &retenir le mercure en C. *je n'ay que trouver ce qui ſeroit neceſſaire pour repouſſer le mercure en* C. *et ainſy contenir l'air dans l'eſpace* Æ. C. *non obſtant la chaleur. Je poſe pour principe ce que l'experience fait voir, c'eſt que quand une quantité d'air occupe un certain eſpace que j'appelle.* Æ. *et que la preſſion qui le retient dans cet eſpace ſoit* B. *ſi on vient à augmenter cette preſſion de telle quantité que l'on voudra comme* X. *on diminuera l'eſpace* Æ. *d'une certain quantité.* D. *laquelle quantité eſt au reſtant.* M. *comme* X. *eſt à* B.

D. M : : X. B.
donc
M. D : : B. X.

Il eſt aiſé d'appliquer cette reigle à l'experience cy deſſus; car Æ. f. *ou* $\frac{5}{8}$ *de pouce ſont l'eſpace* Æ. *La preſſion ordinaire de l'air, qui eſt de* 30 *pouces jointe æ un pouce de haut que ſe trouve entre* f. *et* H. *eſt* B. X. 31 *pouces de mercure : et ſi nous y en adjouſtons aſſez pour reduire l'air à l'eſpace.* Æ. C. *le dit.* Æ. C. *ſera* M. X. $\frac{3}{8}$ *et.* f. C. *ſera* D. X. $\frac{3}{8}$.

Poſant donc. M. D. . B.
32. 3. 31.

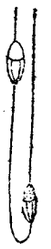
La quatrieſme proportionelle ſera. X. X. 2 $\frac{2}{3}\frac{2}{2}$ *pouces, qui eſtants joints à* B. X. 31 *pouces feront* 33 $\frac{2}{3}\frac{9}{2}$ *pouces, dont l'air ſera preſſé en* C. Æ. *qui ſont pres de* 4 *pouces au deſſus de la preſſion ordinaire.*

Experiment made at the ſpire of the cathedral church in Sarum, *by colonel* John Windham, *aſſiſted by Mr.* Thomas Naſh, *clerk of the works, and* John Warner *in* November, 1684.

HAVING gotten together all the ſurveying chains the city afforded, and carefully examined their truth, and having prepared a proper frame for the baroſcope, we went into the church, filled the tube, and with all the nicety we could uſe purged it of the airy particles; and then immerſing it as in the Torricellian experiment, the mercury was there ſuſpended 30 inches, and 50 cents of an inch, meaſuring it from the ſurface of the ſtagnum: then drawing it up to the firſt floor above the vaulting, which is 1033 inches and $\frac{1}{2}$ high from the pavement, the mercury ſubſided 9 cents of an inch: from thence drawing it up to the middle floor, which is 935 inches higher, the mercury ſubſided 8 cents lower than before: and from thence drawing it up to the weather-door, which is 2313 inches higher than the laſt, the mercury ſubſided 23 cents below its ſtation. So the whole height it was drawn up is 4281 inches and a half; and the whole difference of the mercury's ſtanding is 40 cents of an inch. And letting it down the ſame way, the mercury reaſcended to its firſt ſtations.

AT another time with an inverted baroſcope, like the figure in the margin, having made a mark, where the liquor ſtood, when it was below in the church, and drawing it up to the firſt floor over the

Vaulting	Which is above the pavement of the church	1033 and $\frac{1}{2}$.	The liquor aſcended	1 25
To the middle floor		1968.		2 39
To the 8 doors floor		2467.		3 $\frac{2}{2}$
To the weather-door		4281.		5 64
To the top		4800, or 400 feet.		6 40



If your honour deſires to have any other experiments made at the ſpire, Mr. *Naiſh*, whom I have mentioned above, is a perſon well ſkilled in the practical parts of mathematicks, and a great lover of learning, but more eſpecially natural and experimental philoſophy, having all of your honour's philoſophical works. This perſon I know would moſt gladly and heartily embrace any opportunity of ſerving your honour, whenſoever you will be pleaſed to let me impart any thing to him in a letter.

This is humbly advertiſed by, Sir,

your honour's moſt obliged,

and moſt obedient ſervant,

♆ *Decembris* 17.
Anno 1685. *JOHN WARNER.*

AT a place in the great continent in *Europe*, but not far from the ocean, a learned acquaintance of mine keeping a baroſcope ſome years, and being diſcourſed with by me about the difference of the phænomena, that may be expected in places ſituate upon the continent, from what we find in this country, as it is an iſland: he related to me, that a few years ſince, caſting his eyes upon the baroſcope in ordinary weather, and that was calm enough, he was ſurpriſed to ſee the mercury ſo ſtrangely raiſed, as to exceed above two inches its wonted ſtation, which great alteration he found within few hours to have been the forerunner of ſo hideous a ſtorm, as was generally wondred at, and did a great deal of miſchief both in the towns and country of thoſe parts, where it left ſad inſtances of its fury. This wind came all along the continent; but my relator divers times obſerved, that when very boiſterous winds blew from the ſea, and the ſtorms came thence, (which lying to the ſouthward) the mercury in the baroſcope would conſiderably ſubſide, as has likewiſe been obſerved here in *England* by an ingenious gentleman, living within leſs than two leagues of the ſea, to whom I preſented a baroſcope to make obſervations with.

AN

And yet, that this is one of the effects of the temperature of the air in ſummer, ſeems very probable by this experiment, that having two large fictitious cryſtal vials, I cauſed ſome ſtopples of the ſame matter to be exquiſitely ground, and fitted, this or that veſſel exactly cloſed, when the ſtopple was in it, was very eaſy to be opened in winter, and in the colder parts of the neighbouring ſeaſons; but in ſummer it was oftentimes ſo difficult to unſtop the ſame veſſel, that a man's force, though aſſiſted with a ſtring, was not able to pull out the ſtopple: ſo that I was often reduced to cauſe the necks of the vials to be held under a pump, or to be ſtirred to and fro in a veſſel full of water, that the coldneſs of that liquor might take off the expanſion, that the heat of the ſeaſon had given the glaſs, which being by this means made to ſhrink into its former dimenſions, the vial and ſtopple would be eaſily enough disjoined. This was tried in ſeveral veſſels, and in more than one more year. But to make this experiment ſucceſsful, two parts muſt at firſt have been exquiſitely adjuſted to one another, which in thoſe glaſſes, with ſtopples of the ſame matter, that are commonly ſold, they are not uſually found to be.

We are wont to attribute the effects, we feel of the ſummer's heat, to the bare warmth of the air, and to the agitations, that ſuch warmth produces in the parts of our bodies, eſpecially in the blood, juices, and ſpirits; whereas it may very well happen, that we may find odd changes in ourſelves, upon very hot weather, which proceed not from the heat of the air as ſuch, but rather from this cauſe, that by ſuch a degree of heat, divers bodies, that we think not of, may be ſollicited to ſend forth effluvia, that have emitted none by force, or at leaſt no ſuch quantity as could make them ſenſibly operative. And theſe effluvia may be the true and immediate cauſes of divers effects, that are unwarily aſcribed to the mere heat of the air, and that, which it produces in our bodies. To illuſtrate and confirm this conjecture, I ſhall propoſe the following experiment.

Being in the heat of ſummer in the country, I took a ſomewhat large piece of fine amber, that I uſually employed about electrical experiments; and when the ſun had reached a conſiderable height above the horizon, I placed it in a ſhaded part of a window, on which he ſhined freely: though I left the amber here for a competent time, yet I could not find, that it would draw a piece of ſtraw, feather, or other light body, that at a convenient diſtance was held to it. But when I removed it a very little farther into a part of the window, into which the ſun-beams fell freely, they quickly put its parts into ſuch an agitation, as made it emit electrical effluvia, and readily attract thoſe light bodies, that would not ſtir before, and which it would ſoon, though not immediately, loſe the power of drawing, as before, if it were removed back into the neighbouring ſhaded part of the window.

May 26. Mr. *Nickſon*, who was four years governor of the Engliſh colony in *Hudſon*'s bay, anſwered me, that when they ſailed within a certain diſtance of floating iſlands of ice, if the wind blew from thence toward the ſhip, or, as the ſeamen ſpeak, if they were to the leeward of the ice, they could by the new and ſenſible cold they felt, know, that ſuch ice lay to windward of them, ſometimes even before they were able to diſcover it by ſight. And when I farther aſked, at what diſtance that might be, he anſwered, that it was ſometimes twelve or fifteen miles, if not twenty. He added, that uſually, when the wind blew from thoſe great maſſes of congealed water, it brought along with it a foggy air, which he ſuppoſed to come (as well as the cold) from the ice.

The ſame gentleman anſwered me, that in that part of *Hudſon*'s bay, wherein he wintered, the rivers began to freeze about the latter end of *October*, or beginning of *November*, and uſually were not free from ice till about the middle or latter end of *May*, though he divers times took the latitude of *Charleton* iſland, the place moſt frequented by the Engliſh, and ſeated at the bottom of the bay, and found it to be near the ſame with that of *London*, and at moſt but about 52 degrees.

When I enquired about the depth of the ice in the rivers, he anſwered, that they had often occaſion to obſerve it; for in the winter they made their wells there, (not in the ground) and were obliged to dig about ſix foot deep in the ice, before they could come at unfrozen water.

He anſwered me, that when they ſent their men up into the country, their bottles of brandy would oftentimes ſo freeze, that about a fourth part of it would be turned into ice. And when I aſked, whether the unfrozen part of the liquor was not exceeding ſtrong, he anſwered me, that it was, and ſometimes ſo much ſo, as to be too fiery and unpleaſant to the taſte.

He anſwered me, that he always found the ice freſh, that floated upon the ſea-water; and that when they wanted freſh water, or had a mind to ſpare what they had aboard, they often ſupplied themſelves out of the cavities of great floating maſſes of ice; in which hollow places the ſun-beams thawing ſome parts of the ice, they frequently found ſtore of liquor, that was produced by the action of the ſun-beams upon the ſuperior parts of the ice, whence the water ran into theſe cavities. He added, that when the ſeamen were in haſte, they uſed to relieve themſelves by cutting or breaking off pieces of the floating ice, and preſently melting it in their pots.

A learned traveller, that made ſome conſiderable ſtay among the high Pyrenean mountains, anſwered me, amongſt other notable things, about which I made enquiry, that he had ſeveral times obſerved at the top of one or other of thoſe tall hills, that the air would be very hot, and that yet the ſame day, and perhaps within very few hours, the

place would be covered with ſnow, though it were then ſummer time.

Doctor *N.* anſwered me, that the winds he felt at *Morocco* were ſo very hot, that they were ready to ſtifle him, ſeeming to him like the ſteams and ſmoke coming out of the mouth of an oven.

The Ruſſian emperor's phyſician confirmed to me, that at *Archangel* (where he was more than once) they averred to him, that in winter time a northerly wind (which comes from the ſea) produces a kind of thaw, ſo as to make the eves drop, though a north-eaſt wind rather confirms the froſt; but on the contrary, a ſoutherly wind which, blows over a thouſand or a hundred miles of frozen land, does rather increaſe the froſt, than bring the thaw.

A very inquiſitive perſon, that viſited the lofty Pyrenean mountains, anſwered me, that he and his company had more than once obſerved, from the top or higher part of one of thoſe hills, that though it were fair weather there, yet a great way beneath them, the hill was ſurrounded with thick clouds, which produced ſtorms of rain on the lower grounds: and that (which was the chief point I enquired after) they could manifeſtly ſee, that out of thoſe clouds, when it thundered, lightnings flaſhed upwards as well as they are generally obſerved to do it downward.

October 19. Doctor *Stubbs* aſſured me, that having at *Jamaica* taken a bolt-head about two foot and a half in length, he uſually fonnd, that betwixt 7 and 8 in the morning, which they there call the faint time (of the day) becauſe for want of the daily breezes, the exceſſive heat makes them to faint away; the water was wont to riſe in the neck but a quarter of an inch and a half, though at that time, by reaſon of the winds, men found the heat very ſupportable: and after noon was paſt, the water would ſubſide by degrees till towards the above mentioned time the next morning. This happened in a ſouth window, where the freſh winds come fully and freely in to beat upon the bolt-head, without any glaſs to ſkreen the veſſel from the wind.

He added, that though the bolt-head were not ſtopped, yet the water did not even in that hot country decreaſe ſenſibly in eight or ten months.

A heedful perſon, that frequented the coaſt of *Sumatra* in the *South-Sea*, anſwered me, that he never obſerved ice or froſt, or ſnow, in that great iſland, but that he had known hail fall even in that torrid climate.

Though the famous iſland of *Ceylon* lyes almoſt in the midſt of the torrid zone, namely, between the 6th and 10th degrees of northern latitude, yet an obſerving man, that lived many years upon it, told me, that in hills not ſo high, but that we might eaſily aſcend to the top in half an hour, the inequality of the air's temperature, as to heat and cold, was very great: for he had divers times obſerved in himſelf and others, that though at the bottom of the hill the heat was ſo great, as to oblige them to go almoſt ſtark naked, yet when they aſcended the hill, they found the air quite altered; and as they went up higher and higher, the cold increaſed upon them; ſo that notwithſtanding the heat, ſo uneaſy a motion as climbing had given them, the coldneſs of the air obliged them to put on unuſually warm clothes, and at the top of the hill they would for all that be ready to quake for cold.

Captain *Knox* anſwered me, that in 18 years, that he ſpent in the inland of *Ceylon*, he never obſerved any ice or ſnow, nor any more than a little kind of meteor, that was between dew and hoar froſt, which ſometimes in winter mornings appeared very oddly, but quickly vaniſhed. And when I aſked, if he had not ſeen hail itſelf, he anſwered, that he never ſaw it but once, but the inhabitants looked upon it as a wonderful thing, unſeen by them before; that the hail was as large as a black cherry, but not very round, and ſeemed to have the corners melted, which made him think it had been formed high in the air; that for fear of miſtaking, he not only gathered ſome of it, but champed it between his teeth, and found it cold and hard, like our European hail; and that he was fain to be nimble in making his trials, becauſe when the hail came to touch the ground, it would melt away much more ſuddenly than one would have expected.

Gregory being aſked, upon a very ſultry day, whether it were not very hot in *Germany*, made anſwer, to day has been ſomething hot; ſuch is the winter in *Suaquena*. *Ludolf.* hiſt. of *Ethiop.* L. I. c. 5.

The heat of the iſland *Suaquena*, *Gregory* uſed to call infernal: for, ſays he, it excoriates the ſkin, melts hard Indian wax in a cabinet, and ſears your ſhoes like a red hot iron. *Ludolp.* hiſt. of *Ethiop.* L. I. c. 5.

The higher you aſcend the mountains of *Ethiopia* from the coaſt of the *Red Sea*, the more temperate you ſhall feel the air, inſomuch, that as *Tellezius* witneſſes, in many regions of *Ethiopia* the ſummer heats are more mild than in *Portugal*, ſo many degrees diſtant towards the north; nay, there are ſome mountainous countries, as in *Samen*, where the cold is more dreadful than the heat. Nevertheleſs there falls none, or very little ſnow in theſe parts, only a certain ſmall ſort of hail ſometimes covers the ground, which at a diſtance looks like ſnow. *Ludolp.* hiſt. of *Ethiop.* L. I. c. 5.

An intelligent perſon, that was for many years conſul of the Engliſh Nation at *Tripoli* in *Barbary*, being aſked ſome queſtions about the air, and the winds in thoſe parts, anſwered me, that when in ſummer time the wind blew over the great ſandy deſerts, that reach very far into the country, the wind, and the ſand it brought along with it, oftentimes felt as hot as the ſteams, that come out of an oven, when the mouth is opened, inſomuch, that he could not, without great inconvenience, turn his face towards the quarter whence the wind blew.

An ingenious gentleman, that was employed in the French colony, on the coaſt of *Africk*, and lived in thoſe parts about five

yoars, anſwered me, that in the iſland of St. *Louis*, or near it, at a certain ſeaſon of the year, when the hot winds blew from the continent, the ſand on the ſhores would be ſo ſcorching hot, that he was not able to ſtand upon it, but it would, through the ſoles of his ſhoes, ſcorch his feet, unleſs he walked very faſt. And then the air ſeemed to him to be thick, and, as he expreſſed it, heavy and hot, as if it came out of an oven. And when the wind blew from a wood, where divers elephants and other wild beaſts lay dead, the ſteams of their carcaſſes would make the air ſo ſtinking and offenſive, that it was ſcarce ſupportable.

In ſummo ejus montis, Idæ ſc. faſtigio ſacellum eſt, quod ædificiolo duntaxat conſtat ſaxis ſibi invicem impoſitis, & ſine calce cohærentibus, fornicis in modum conſtructo, ad tectum præbendum. Sublimi adeo loco eſt, & à vehementioribus ventis interdum ita perflato, ut lapilli inde transferantur. Paulo infra id ſacellum planities conſpicitur montibus undique cincta, in quâ multa ſunt paſcua, ubi arietes & capræ Cretenſes æſtate pingueſcunt. Si quis ex ſummo montis vertice undique proſpiciat, parum aberit, quin totius inſulæ ambitum videat cum aliis vicinis inſulis, Miſo, Cerigo, ſive Cythera reliquiſque Archipelagi. Aeris intemperies in hoc monte adeo magna eſt, quemadmodum ut in cæteris præcelſis montibus, ut in ipſis caniculæ ardoribus meridie, nullo etiam ſpirante vento, ingens ſentiatur frigus: qua de cauſa nec hyeme, nec æſtate quiſquam eum incolit. Nam licet paſtores interdiu ovium greges ad paſcua agunt, noctu tamen in valles ſe recipiunt.

Petri Bellonii, Lib. I. cap. 1.

In the next chapter.

Latè porro patet hic mons, ejuſque radices utrinque maris littora, ut ante diximus, attingunt; nam licet urbi Candiæ ſunt vicinæ, meditullium tamen inſulæ occupat ipſe mons, adeo in ſublime evectus, ut nives ejus verticem perpetuo tegant; tamque frigida aura mediis etiam æſtatis ardoribus iſthic eſt, ut vix ferri queat; tametſi in convallibus magnus ſit æſtus.

Contigit id meæ experientiæ, quod etiam aliis contigiſſe audivi, ut aſcenderem ad ſummitatem uſque montis Veneris, qui omnium in Patavino agro altiſſimus eſt, ibi per totum diem habui aerem ſereniſſimum, ſed infra circiter medium montis vidi nubes, quæ me viſione vallium prohibebant, veſperi autem, poſtquam de illo monte deſcendi, inveni factam eo die infera parte magnam pluviam, cum in montis cacumine nihil pluiſſet; ex eo intellexi me tranſiiſſe per mediam aeris regionem, in qua eſt facta pluvia, nec tamen eam ſenſi frigidiſſimam, imò vix aliquam animadverti differentiam frigidioris & calidioris aeris, nam æſtivum tempus erat, pro æſtivo tempore eram veſtitus, nec tamen tantum frigoris, quod me læderet, ex eo loco percepi; pars igitur illa non eſt abſolutè frigida, ſed ſolùm comparatione inferi aeris calidioris.

Jacobi Zabarelli de regionibus aeris, c. 8.

Idem de Alpibus proprio exemplo edoctus teſtatum reliquit Bartholinus Syſt. Phyſ. Inſtit. Succinct. de Terra, Aere, & Igne, c. 4. Reſp. 1.

Doctor *B.* anſwered me, that being at and near *Morocco*, he could ſee mount *Atlas* covered with ſnow, though it was then in the heat of ſummer, and exceſſively hot where he was.

An intelligent traveller, that had viſited ſome high mountains, and particularly the *Alpes*, and the *Pico* of *Teneriffe*, anſwered me concerning this prodigious hill, that he found it very cold in aſcending towards the top; and that as for the mount *Cenis*, one of the famouſeſt of the *Alpes*, when he paſſed over it into *Italy*, though it were in *Auguſt*, and the weather very clear, yet he felt at the top a wind ſo cold, that he could ſcarce poſſibly endure it, and ſeemed to him the coldeſt, that in all his various travels he had ever felt; and yet ſome of the mountains ſeemed much higher being then covered with ſnow.

An intelligent gentleman, that had been a traveller into the *Eaſt-Indies*, told me, that he never ſaw nor heard of any ſnow or ice in *Guinea*, but that in ſome parts of *Barbary*, where in the plains and vallies he found the heat ſcorch inſupportable, he could ſee the top of the mountains covered with ſnow, in which ſtate they continued all the year.

A man of letters, that lived in many countries of the *Eaſt-Indies*, being aſked by me divers queſtions, partly about other things, and partly about the temperature of the air in ſeveral regions, gave me, among other anſwers, this, that on the high mountain in the iſland of *Ceylon*, notwithſtanding the heat of the country, there was ſnow; and the like he ſaw on the tops of the mountains of *Congo*, though in the lower parts of the country they never have, that he heard of, either ice, ſnow, or hail.

About Midſummer, 1688, I placed in the cave a glaſs, with ſpirits, which ſtood above temperate about ½ of one of the ſmall diviſions: another glaſs placed without, in a common room, ſtood at hot.

The Chriſtmas following I placed the ſame glaſſes in the ſame places, and the glaſs in the cave ſtood, as before, about temperate; that without ſtood at froſt.

The cave is cut into the bottom of a clift, that fronts to the ſea: the earth is about 80 foot above it, and it is cut right in about 130 foot.

The other day two gentlemen belonging to the province of *New-Hampſhire* in *New-England*, (whence they came not long ſince) and employed by that colony to his majeſty here, anſwered me, that in the winter the coldeſt wind, that blows in the country, is the north-weſt; and being aſked again, what was their hotteſt wind in ſummer, they told me, it was likewiſe the north-weſt. At which anſwer being ſurpriſed, I aſked them, whether they could give any reaſon of ſo odd a phænomenon. Whereto they anſwered, that they aſcribed it to the large tract of the continent, and the great woods that lay to the north-weſt; which woods, they ſaid, in the winter had their branches, through which the wind paſt, all laden with ſnow: and in the ſummer, they ſaid, the cloſe air of the vallies, and the thick ſteams, that filled it, would

would conceive ſo intenſe an heat, that ſometimes in the heat of ſummer, when a ſudden puff of wind blew upon their faces from thoſe ſultry vales, it ſeemed to them, as if it came out of the mouth of a furnace, and would be ready to overcome them with the faintneſs produced by the heat and vapours it brought along with it.

Balbini hiſt. Bohem. L. 1. c. 9. *De montibus, & de valle Lauezka, p.* 29. *Chanowſki in veſtigio Bob. piæ, c. ult. Montes parte altera æſtatem, alterâ hiemem referentes.*

De montibus ad Bavariam ſtantibus mira eſt Alberti Chanowii noſtri narratio: poſt Bergreichenſteinam (oppidum fodinis hodieque nobile) eſſe montes non tam ſitu (alii enim ad ſeptentrionem, alii ad meridiem latus obvertunt) quam cœlo & temporibus adverſantes, vallibus latiſſimis montes illos dirimentibus; monſtri inſtar eſt (quod ſe vidiſſe, & anno 1639. *in rem præſentem veniſſe religioſiſſimus ille & apoſtolicus vir aſſerit) in altero monte ſæpius æſtatem, in altero appoſito hiemem dominari, ita ille ſiccus æſtivat, hic altiſſimis nivibus obſitus à viatore ſuperari non poteſt; ob eamque cauſam meſſes ipſæ variant, & dum in montibus ad nos obverſis demeſſa ſunt omnia, altera montium parte ſeges vireſcit: mirius illud, quod in Bieſſinenſibus & Czachrovienſibus agris in tractatu Plſnenſi, contiguis, quos unus tantum ſulcus dirimit ac dividit, deprehenditur: Czachrovienſes adhuc hibernant, cum in Bieſſinenſi cœlum ardeat; ibi caput attollit humo frumentum, cum Czachrovii adoleſcit in culmum; elemento quoque diſpari, illud riget, hoc tepet & fervet, eâque ex causâ, dum Czachrovienſes bene pelliti ingrediuntur, Bieſſinenſes pellibus onerari ſe ſentiunt, villoſque deponunt. Aliquid tale anno* 1652. *mihi quoque accidiſſe memini: nam cum Glacio Zambergam in Bohemia contenderem, & Glacio ob nives altiſſimas certum vehiculi genus, quod trahas dicimus, ſumpſiſſem, ſuperatis montibus, qui comitatum Glacenſem à Bohemia dividunt, ſubitò alia rerum facies apparuit: altero enim montium latere viridia omnia reperimus, ſic ut trahæ nulli jam rei & uſui eſſent, & currum petere cogeremur, niſi in luto natare placuiſſet; at accolæ montium illorum quotannis id ſibi accidere confirmabant, ut unum latus montium profundiſſimæ nives contegerent, quando alterum latus lectiſſimos flores proferret, & cum ibi omnia ventis verti viderentur, apud ſe è floribus ſuaviſſimos odores effiari.*

Id. ibid.

I LEARNED, by enquiry of an ingenious gentleman, who ſeveral times went into the Hungarian gold-mine at *Cremnitz*, that when he was drawn up out of the deep pit, or perpendicular groove, whoſe depth exceeded 100 feet; when he had aſcended above half the way, he found the air ſenſibly warm, and ſo it continued, till he came by many foot nearer the day, as the workmen call the orifice of the pit. And when I aſked, whether this notable and ſudden heat did not proceed from ſome mineral, through which he paſſed in that region of the earth, or part of the groove, he anſwered me, that he believed it did, in regard he was there ſurrounded with a vein or bed of native vitriol, ſome of one colour, ſome of another, which he found to be ſoft under ground, though it ſoon after hardened in the air: and of theſe differingly coloured ſorts of vitriol he brought up thence ſeveral pieces, ſome of which he preſented me. And when I aſked, whether the new heat he found in that part of the mine, did not proceed from its being much nearer than the lower part to the air, which at that time was hot; and whether he found the heat to increaſe as he came nearer the day; he anſwered in the negative, and told me, that after he had in his aſcent left beneath him that warm region, he found himſelf cold again in the ſuperior part of the groove, to which the vitriolate region did not reach.

I REMEMBER on this occaſion, that aſking an intelligent perſon, who had more than once croſſed the torrid zone, what expedient they uſed in his ſhip, to keep their beer and other liquors cool enough to be drinkable in thoſe ſultry climates; he anſwered, that their way was to take the bottle they mean to uſe, and wrap it about with a coarſe linen cloth dipped in the ſea-water, and then in ſome more convenient place of the ſhip hang it in the wind, which beating freely and inceſſantly upon it, would in no long time cool it to be potable enough. And this gentleman, who was an obſerving perſon, added farther, that having ſometimes for curioſity ſake taken away a bottle before it had been expoſed above half the uſual time, he was able to find by the taſte, that part of the beer or wine, that was next the ſides of the bottle to be refrigerated, whilſt the more inward parts of the liquor did yet continue hot.

THE *Czar*'s chief phyſician confirmed to me, that in the year 1664, or 63, extraordinary dry and great ſcopes of land were ſet on fire, and miſerably waſted by the great heat of the ſun. And he added, that the very laſt year he found the like to have happened in *Norway*, particularly in a place called by us *Bear-haven*; where having ſeen the ruin of divers wood houſes burnt, and enquiring into the cauſe, he was anſwered, that the weather being very dry and hot, not only the graſs and other vegetables were ſcorched up, but thoſe wooden houſes among others were ſet on fire, which was confirmed to him by the governor of the place, and countenanced by this circumſtance, that he ſaw the country covered with a freſh and verdant livery of new graſs, brought up inſtead of that which was burnt, by ſome rains, that fell a while before.

A TRAVELLER and ſcholar being aſked by me, whether at *Mozambique*, which is thought the hotteſt place in the known world, he had never obſerved the houſes to be ſet on fire with the mere heat of the ſun? he anſwered me, that in the three months he ſtayed there, he ſaw no ſuch thing, but the inhabitants affirmed it to be not very unfrequent; and as he paſſed to and fro, ſhewed him divers houſes that had been ſo burnt; which was the leſs ſtrange, becauſe the houſes are not built of ordinary ſtone, whereof they have none there, but fetched from another place he named, where the ſtone is mingled with a ſubſtance, much of the nature of a ſulphur vivum.

vivum. And he added, that he himſelf had divers times ſeen the ſtones ſo heated in hollow places, that muſket-bullets being expoſed there to the direct beams of the ſun, were in no very long time melted. He ſaid farther, that much of the exceſſive heat of *Mozambique* proceeded from the ſoil, which is exceeding bare and dry, conſiſting of white ſand, and that it is not covered with graſs, nor ſhaded with trees.

An obſerving traveller, that had been at *Mozambique*, being for the moſt part, where it is not ſhaded with trees, ſandy, he found the ſun, which was almoſt in the zenith, to heat the ground ſo much, that he was not able to ſtand ſtill for ſome time, but was fain to keep walking to avoid burning the ſoles of his feet.

Un gentilhomme de mes amis plein de merite et digne de creance me mande, entre pluſieurs choſes extraordinaires, qu'il à obſervées proche de Barege aux Pyrenées, qu'il y à des ponts de niege d'un rocher à l'autre pardeſſous leſquelles paſſent des torrents. Il en a vu un, qui embreſſe deux torrents, et qui a vint neuf toiſes de long et autant de large par deſſus. Il y a par deſſous ce pont neuf toiſes et demi entre les naiſſances de la voute, les ponts ſont tellement forts, qu'il eſtime que du canon y paſſeroit, et il a fait rouler de groſſes pieces par deſſus.

Le tremblement de terre, que ſouffrit la Syrie l'an 750. *ne fut gueres moins ſurprenant; puiſque la terre s'eſtant ouverte de toutes partes, pluſieurs villes furent abîmées, d'autres renverſées, et quelques unes, qui eſtoient elevées ſur des hauteurs, tranſportées dans des plaines eloignées de ſix mille de leur ſituation. On en peut dire autant da froid extreme, qui l'an* 753. *glaça le Pont-Euxin à la longueur de cent mille, et toute l'eſtendue de la mer voiſine, juſqu' à* 30 *coudées de profondeur, quoy qu'on ne fût encore qu'au commencement de l'automne. Journal de Sçavans* III. 1685.

Asking an intelligent perſon, that lived a good while in *Guinea*, how they did to keep their water cool in ſo hot a place, he told me, that in ſome corner of their huts they were wont to make holes in the ground, in which they buried over night the long earthern jars, or other veſſels, ſo as that the orifice of the veſſels might be lower (though not very much ſo) than the level of the ground. By this means the water would become drinkable, with ſome coolneſs, from the beginning of the morning to nine or ten of the clock, after which it would grow diſtaſtefully hot. He added, that when they were abroad in the fields, he did as well cool his water, by putting it into callibaſhes, and hanging them all night upon the branches of trees, eſpecially where they were expoſed to the wind.

February. Since now I have ſpoken ſo much of the cold, I hope it will not be too coldly taken, if in a few words I make it ſome way to appear unto our readers.

We made three differences of the cold, all according to the places: in our houſe, in the woods, and in the open air, upon the ice, in our going to the ſhip.

For the laſt, it would be ſometimes ſo extreme, that it was indurable; no clothes were proof againſt it, no motion could reſiſt it. It would, moreover, ſo freeze the hair on our eye-lids, that we could not ſee; and I verily believe, that it would have ſtifled a man in a very few hours: we did daily find by experience, that the cold in the woods would freeze our faces, or any part of our fleſh that was bare; but it was yet not ſo mortifying as the other. Our houſe on the outſide was covered two third parts with ſnow, and on the inſide frozen and hung with icicles. The clothes on our beds would be covered with hoar froſt, which in this little habitacle was not far from the fire. But let us come a little nearer to it. The cook's tubs, wherein he did water his meat, ſtanding about a yard from the fire, and which he did all day ply with melted ſnow-water; yet in the night-ſeaſon, whilſt he ſlept but one watch, would they be firm frozen to the very bottom: and therefore was he fain to water his meat in a braſs kettle cloſe adjoining to the fire; and I have many times both ſeen and felt, by putting my hand into it, that ſide, which was next the fire, was very warm, and the other ſide an inch frozen. I leave the reſt to our cook, who will almoſt ſpeak miracles of the cold. The ſurgeon, who had hung his bottles of ſyrups, and other liquid things, as conveniently as he could, to preſerve them, had them all frozen. Our vinegar, oil and ſack, which he had in ſmall caſks in the houſe, were all firm frozen. It may further in general be conceived, that in the beginning of *June*, the ſea was not broken, and the ground was yet frozen; and thus much we found by experience in the burying of our men; in ſetting up the king's ſtandard towards the latter end of *June*; and by our well, at our coming away in the beginning of *July*, at which time, upon the land, for ſome other reaſons, it was very hot weather. Capt. *James*.

Obſervations on the top of the Pyreneans.

Monſieur *L. J.* confirmed to me what he had formerly told me, that upon the higheſt mountain of the Pyreneans, called *Pic de Midi*, he aſcended at the end of *Auguſt*, or the beginning of *September* (in the morning) to the very top, where he and his company ſpread a tent, and ſtaid till the evening: he ſays, he found the air temperate where the ſun did not beat; but on that ſide of their bodies, whereon the ſun ſhone, the heat was exceeding great, and was offenſive, even to them, that ſat in the tent of oiled cloth, if they ſat too near the ſunny ſide of the tent: they ſometimes had wind at the top of the hill, which they found to blow cool enough, (and found it very cold, when they returned to the bottom.) This hill is ſo high, that it may be ſeen from *Montauban*, which is 27 leagues diſtant.

When I aſked, whether the air in thoſe places, where the ſun did not beat, was conſiderably cold? he told me, that the exerciſe they had been put to in aſcending the top of the hill (for the moſt part of the way they

rid up) kept them from being very competent judges of that; but they found the wind northerly, though weak, yet very cooling; and the north ſide of the mountain was even then covered with ſnow, and ſcarce at all paſſable.

An ingenious phyſician, Dr. *B.* that has been in divers of the inland parts of *Africa*, among other anſwers, that he returned to the queſtions that I aſked him, about the temperament of the air in thoſe parts, gave me this memorable one, that having had occaſion at *Morocco* to uſe ſome good dried fine jalap, that he had brought with him out of *England*, he found it by the heat of the air to be melted, and by conſequence to be impulverable, in which ſtate it continued whilſt he lived in that country; but when he was returned to *Tangier*, he found it both there, and in the neighbouring parts, pulverable again.

P. Franceſco Barretto relatione della provincia di Malavar. p. 52.

Nel capo di Comorino ſi termina coſi l' eſta, come l' inverno dalla parte, di la dal capo verſo Notte, & dal' altra parte correſpond il tempo aſſai contrario è diverſo, di maniera che, chi va navigando, per quella coſta nel meſe di Ottobre, ſino ad Aprile, naviga nel eſta, è non puo in tutto queſto tempo paſſare il capo per eſſer ivi la ſtagione dell inverno, et il Padre, che reſtede nelle Chies ch'appartengono al Capo di Comorino ne alcune la ſtate, il che è coſa di gran meraviglia, eſſendo cio nel medeſſimo tempo nella diſtanza ſolamente di due, ò tre miglia.

An eminent virtuoſo anſwered me, that in *Tirol* he had viſited a very deep mine, into which he deſcended three hundred Klaſters, which by his computation makes about eighteen hundred of our feet: that he paſſed not through, that he took notice of, one hot region by the way. That at the bottom of the mine he breathed very freely, becauſe of the air ſhafts, by which acceſs was given laterally to the ſuperior air; and that being thinly clothed with one of the digger's habits, he found at the bottom the air temperate, as to heat and cold, though it were then ſummer-ſeaſon of the year: ſo that notwithſtanding what is ſaid of antiperiſtaſis, no intenſe cold was retreated thither, to ſhun the heat of the ſuperior air.

An ingenious gentleman, very converſant in our Engliſh mines, of one of which he is owner, anſwered me, that the deepeſt mine he had particularly viſited, was a tin mine, whoſe depth was ſixty ſix fathoms, that is almoſt four hundred foot. That deſcending into this mine in ſummer, he found it very cold at the bottom, and the greateſt part of the way going down, without perceiving any hot region. And when I aſked him, how ſoon he begun to find a ſenſible cold in deſcending, he told me, that he found it within two fathom or leſs of the orifice of the pit; and that in this and divers other mines he perceived a ſenſible cold to begin before he got down a yard, or perhaps half a yard beneath the upper part of the faſt, as the minemen call the ſolid earth, in which they diſtinguiſh from the looſe earth, that lyes above it; and is, if I may ſo call it, the ſcurf of the earth, that is far more light and porous than the other, though it be upon this looſe earth that plants grow, and into which even great timber trees themſelves ſhoot, and ſpread their roots ſeldom or never reaching to, or penetrating into the faſt, though this lye ſometimes near enough to the external ſurface of the cruſty earth.

An exact relation of the Pico Teneriff, *taken from Mr.* Clappham.

About the 20th of *Auguſt*, 1646, Mr. *Clappham*, together with Mr. *Philip Ward*, *John Webber*, *John Cowling*, *Thomas Bridge*, and *George Cove*, all of them very conſiderable merchants, and worthy of credit, with one guide, ſervants and horſes to carry their wine and proviſions, did ſet out from *Oratava*, a port-town in the iſland of *Teneriff*, ſituated on the north, at two miles diſtance from the main ſea: they travelled from twelve at night till eight in the morning, by which time they got to the top of the firſt mountains towards the *Pico de Teraira*; here, under a very great and conſpicuous pine-tree they brake their faſt, dined, and refreſhed themſelves till two in the afternoon, and then proceeded through much ſandy way, over many lofty mountains, but naked and bare, and not covered with pine-trees, as their firſt night's paſſage was, which expoſed them to exceſſive heat, till they arrived to the foot of the *Pico*, where they found many huge ſtones, which ſeemed to have been fallen down from ſome ſuperior part. But before we proceed farther to give any account of this journey, give me leave here to interſert the opinion of Dr. *Pugh*, a perſon of very great reputation, at this time in the city, who lived twenty years himſelf on the place, both in the quality of a phyſician, and a merchant, and was very curious and inquiſitive into all that was in the iſland: his opinion is, that the whole iſland of *Teneriff*, being a ground mightily impregnated with brimſtone, did in former times take fire, and blow up all, or near upon all at the ſame time; and the many mountains of huge ſtones calcined and burnt, which appear every where about the iſland, eſpecially in the ſouth-weſt parts of it, were raiſed and heaved up out of the bowels of the earth, at the time of the general conflagration; and the greateſt quantity of this ſulphur lying about the centre of the iſland, raiſed up the *Pico* to that height, at which it is now ſeen. And he ſays, that any one upon the place, that ſhall carefully note the ſituation and manner of theſe calcined rocks, how they lye for three or four miles almoſt round the bottom of the *Pico*, and in ſuch order one above another, almoſt to the very ſugar-loaf (as it is called) as if the whole ground, and riſing up together with the accenſion of the brimſtone, the torrents and rivers of it did with a ſudden eruption, roll and tumble them down from the

reſt of the rocks, eſpecially (as we ſaid before) to the ſouth-weſt; for on that ſide, from the very top of the *Pico*, almoſt to the ſea-ſhore, lye huge heaps of theſe burnt rocks, one under another; and there remain to this time the very tracts of the rivers of brimſtone, as they ran over all this quarter of the iſland, which has ſo waſted the ground beyond recovering, that nothing can be made to grow there, but broom. But on the north ſide of the *Pico*, few or none of theſe ſtones appear; and he concluded hence, that the vulcano diſcharged itſelf chiefly to ſouth-weſt. He adds farther, that mines of ſeveral metals were broken and blown up at the ſame time; theſe calcined rocks reſembling ſome of them iron ore, ſome ſilver, and others like copper, particularly at a certain place in theſe ſouth-weſt parts, called the *Azuleios*, being very high mountains, where never any Engliſh but himſelf (that he ever heard of) was. There are vaſt quantities of a looſe blueiſh earth, intermixed with blue ſtones, which have on them a yellow ruſt, as that of copper and vitriol, and likewiſe many little ſprings of vitriolate waters; here he ſuppoſes was a copper-mine. And he was told by a bell-founder of *Oratava*, that out of two horſe-loads of earth, he got as much gold as made two large rings: and a *Portugueſe* told him, who had been in the *Weſt-Indies*, that his opinion was, there were as good mines of gold and ſilver there, as the beſt in the *Indies*. There are likewiſe hereabouts nitrous waters and ſtones covered with a deep ſaffron coloured ruſt, and taſting of iron. And farther he mentions one Mr. *Gilbert Lambell*, a friend of his, who of two lumps of earth or ore, brought from the top of this ſide the mountain, made two ſilver ſpoons. All this he confirms from the late inſtance of the *Palm* iſland, eighteen leagues from *Teneriff*, where a vulcano was fired about twelve years ſince, the violence whereof made an earthquake in this iſland ſo great, that he and others ran out of their houſes, fearing they would have fallen upon their heads: they heard the noiſe of the torrents of flaming brimſtone, like thunder, and ſaw the fire as plain by night, for about ſix weeks together, as a candle in the room; and ſo much of the ſand and aſhes brought from thence, by the wind, by clouds, fell on his hat, as filled a ſand-box for his ink-horn, Thus far he.

To reſume therefore the narrative of their journey; about ſix a clock this evening, they began to aſcend on the *Pico*; but being now a mile advanced, and the way no more paſſable for their horſes, they quitted and left them with their ſervants. In this mile's aſcent ſome of their company grew very faint and ſick; and from Dr. *Pugh*'s report of eighteen in his company, that went up about the middle of *Auguſt*, long after this, but ten got up, and theſe had all drank very plentifully below; the reſt ſo diſordered by fluxes, vomitings, and aguiſh diſtempers, they could go no farther: their horſes hair ſtood upright, like briſtles, with the vehement cold, who ſtood ſhaking, and refuſed to eat any thing till they came down. But calling for ſome of their wine, which was carried in ſmall barrels on a horſe, they found it ſo wonderfully cold, that they could not drink it, till they had kindled a fire to warm it, although yet the temper of the air was very calm and moderate; but when the ſun was ſet, it began to blow with violence, and grew ſo cold, that taking up their lodging under certain great ſtones in the rocks, they were conſtrained to keep great fires before the mouth of them all night. About four in the morning they began to mount again, and being come about a mile up, Mr. *Cowling*, one of the company, failed, and was able to proceed no farther. Here begin the black rocks. The reſt purſued their journey till they arrived to *Sugar-Loaf*, where they begin to travel again in a white ſand, being foreſhod with ſhoes, whoſe ſingle ſoles are made a finger broader than the upper leather, to encounter this difficult and unſtable paſſage, till they are half way up; and a ſpaniel, that went up afterwards with Dr. *Pugh*, (as he relates) went crying all the way, having his ſkin burnt off his feet; and then being aſcended as far as the black rocks, which are all flat, and lye like a pavement, they climbed within a mile of the very top of the *Pico*: but Mr. *Clappham*, who was the foremoſt, would have perſuaded Mr. *Cove* to deſcend again, as imagining the top of all on fire; but at laſt overcoming that apprehenſion, and perſiſting, they gained the ſummit, where they found no ſuch ſmoke as appeared a little below, but a continual breathing of a hot and ſulphureous vapour, which made their faces extremely ſore.

In this paſſage they found no conſiderable alteration of air, and very little wind; but being at the top, it was ſo impetuous, that they had much ado to ſtand againſt it, whilſt they drank the king's health, and fired each of them a piece: here they alſo broke faſt, but found their ſtrong waters had quite loſt its force, and was become almoſt inſipid, whilſt their wine was rather more ſpirituous and briſk than it was before.

The top on which they ſtood being not above a yard broad, is the brink of a pit called the *Caldera*, which they judged to be about a muſket-ſhot over, and near fourſcore yards deep, in ſhape like a cone, within hollow like a caldron, and all over covered with ſmal looſe ſtones, mixed with ſulphur and ſand, from heat; and ſtirred up with any thing, puffs and makes a noiſe, and ſo offenſive, that Dr. *Pugh* was almoſt ſtifled with the ſudden emanation of vapours, upon the removing of one ſtone of theſe; theſe ſtones are ſo hot, as they are not to be eaſily handled: they deſcended not above four or five yards into the *Caldera*, in regard of its ſliding from their feet, and the difficulty; but ſome have adventured to the bottom. Other obſervable materials they diſcovered none, beſides a clearer ſort of ſulphur, which looks like ſalt upon the ſtones.

From

FROM this famous *Pico* they could ken the grand *Canaries*, fourteen leagues diſtant; *Palma* 18, and *Gomera* 7 leagues; which interval of ſea ſeemed to them no larger than the river of *Thames* about *London*: they diſcerned alſo the *Hierro*, being diſtant above twenty leagues, and ſo to the utmoſt limits of the ſea much farther.

So ſoon as the ſun appeared, the ſhadow of the *Pico* ſeemed to cover not only the whole iſland, and the grand *Canaries*, but the ſea to the very horizon, where the top of the *Sugar-Loaf*, or *Pico*, viſibly appeared to turn up, and caſt its ſhadow into the air itſelf, at which they were much ſurpriſed. But the ſun was not far aſcended when the clouds began to riſe ſo faſt, as intercepted their proſpect, both of the ſea, and the whole iſland, excepting only the tops of the ſubjacent mountains, which ſeemed to pierce them through.

WHETHER theſe clouds do ever ſurmount the *Pico*, they could not ſay; but to ſuch as are far beneath, they ſometimes ſeem to hang above it, or rather wrap themſelves about it, as conſtantly when the north weſt winds blows: this they call the Cap, and is a certain prognoſtick of enſuing ſtorms.

MR. *John Webber*, one of his company, who had made a journey two years after, arriving at the top of the *Pico* before day, and creeping under a great ſtone to ſhroud himſelf from the cold air, after a little ſpace, found himſelf all wet, and admiring whence it ſhould proceed, perceived it at laſt to come from a perpetual trickling of the water from the imminent rocks above him.

MANY excellent and very exuberant ſprings they found iſſuing from the tops of moſt of the other mountains, guſhing out in great ſpouts, almoſt as far as the huge pine-tree which was mentioned.

HAVING ſtayed ſome time upon this top, they all deſcended by the ſandy way, till they came to the foot of the ſugar-loaf, which being ſteep, even almoſt to a perpendicular, they ſoon paſſed: and here they meet a cave of about ten yards deep, and fifteen broad, being in ſhape like an oven or cupola, having a hole at the top, which is near eight yards over; by this they deſcended (an active Spaniard ſhewing them the way) by a rope, which their ſervants held at the top, whilſt the other end being faſtened about his middle, he ſwings himſelf, till being over a bank of ſnow, he ſlides down and lights upon it. They are forced to ſwing thus in the deſcent, becauſe in the middle of the bottom of this cave, oppoſite to the overture at the top, is a round pit of water, reſembling a well, the ſurface whereof is about a yard lower than the ſnow, but as wide as the mouth at the top, and is about ſix fathom deep, as Mr. *Lambell* reports, who plumbed it. They ſuppoſe this water not a ſpring, but diſſolved ſnow, or water blown in; for ſome years it lyes ſo full, one cannot get into the cave for water trickling through the rocks.

ABOUT the ſides of the grott, for ſome height is ice, and icicles hanging down to the ſnow: but being quickly weary of this exceſſive cold place, and drawn up again, they continued their deſcent from the mountains, by the ſame paſſages they went up the day before, and ſo about five in the evening arrived to *Oratava*, from whence they ſet forth: their faces were ſo red and ſore, that to reduce them and cool them, they were forced to waſh and bathe them in whites of eggs, *&c.*

THE whole altitude of the *Pico* in perpendicular is vulgarly eſteemed to be two miles and a half.

No trees, herbs, or ſhrubs, in all the paſſage, but pines; and amongſt the white ſands a kind of broom, being a buſhy plant; and at the ſide where they lay all night, a kind of cardon, which has ſtems of eight foot high, the trunk near half a foot thick, every ſtem growing in four ſquares, and emerging from the ground like tuffets of ruſhes; upon the edges of theſe ſtems grow very ſmall red buttons or berries, which being ſqueezed, produce a poiſonous milk, which lighting upon any part of a horſe, or other beaſt, fetches off the hair from the ſkin immediately: of the dead part of this they made their fires all night. This plant is alſo univerſal over the iſland, and is happly, and as I conjecture, a kind of euphorbium.

IN ſome part of this iſland alſo there grows a crooked ſhrub, which they call Legnan-vell, which they bring for *England* as a ſweet wood. There are likewiſe apricots, peaches, and in ſtandards, which bear twice a year: pear-trees alſo which are as pregnant; almonds of a tender ſhell, palms, plantanes, oranges and lemons, eſpecially the pregnadas, which have ſmall ones in their bellies, from whence they are ſo denominated. Alſo they have ſugar-canes, and a little cotton and colloquintida; the roſes blow at Chriſtmas; there are good carnations, and very large, but tulips will not grow or thrive there: ſampier clothes the rock in abundance, and a kind of clover the ground. Another graſs growing near the ſea, which is of a broader leaf, ſo luſcious, as it will kill a horſe that eats of it, but no other cattle. There is alſo an herb which they make thread of. Eighty ears of wheat have been found to ſpring from one root, but it grows not very high; the corn of this is tranſparent and bright, like unto the pureſt yellow amber; and one buſhel has produced 130 in a ſeaſonable year.

THE canary-birds (which they bring to us in *England*) breed in the barrancos of gills, which the water has fretted away in the mountains, being places very cold. There are alſo quails, partridges larger than ours, and exceeding beautiful; great wood-pigeons, turtles at ſpring, crows; and ſometimes from the coaſts of *Barbary* appears the falcon. Bees are carried into the mountains, where they proſper wonderfully.

THEY have wild goats on the mountains, which climb to the very top of the *Pico* ſometimes.

ſometimes. Alſo hogs, and multitudes of conies: camels are brought from *Lancerote*, beſides other cattle.

Fish. The cherna, a very large and excellent fiſh, better taſted than any we have in *England*. The mero, dolphin, ſhark, lobſters without the great claws, muſcles, periwinkles, and the clacas, which is abſolutely the very beſt ſhell-fiſh in the world; they grow on the rocks, five or ſix under one great ſhell, through the top whereof they peep with their nebs, from whence (the ſhells being broken a little more open with a ſtone) they draw them forth. There is likewiſe another fiſh like an eel, which has ſix or ſeven tails of a ſpan in length, united to one head and body, which is alſo as ſhort. Beſides theſe they have turtles and cabridos, which are preferable before our trouts.

The iſland is full of ſprings of pure water, taſting like milk; and in *La Laguna*, (where the water is not altogether ſo limpid and clear) they percolate it through a kind of ſpungy ſtone cut in form of a baſon.

The vines which afford thoſe excellent wines, grow all about the iſland, within a mile of the ſea; ſuch as are planted farther up, are nothing eſteemed, neither will they thrive in any other iſlands.

For the Guanchios, or the ancient inhabitants, Dr. *Pugh* gives this full account.

September 3. about twelve years ſince, he took his journey from *Guimar*, a town inhabited for the moſt part by ſuch, as derive themſelves from the old Guanchios, in the company of ſome of them, to view their caves, and the bodies buried in them. This was a favour they ſeldom permit to any, (having in great veneration the bodies of their anceſtors, and likewiſe being moſt extremely againſt any moleſtation of the dead) but he had done many ſeveral eleemoſinary cures amongſt them, (for they are generally very poor, yet the pooreſt thinks himſelf too good to marry with the beſt Spaniard) which endeared him to them exceedingly, otherwiſe it is death for any ſtranger to viſit thoſe caves or bodies.

These bodies are ſewed up in goat-ſkins, with thongs of the ſame, with very great curioſity, particularly in the incomparable exactneſs and evenneſs of the ſeams; and the ſkins are made very cloſe and fit to the bodies: moſt of theſe bodies are entire, the eyes cloſed, hair on the head, ears, noſe, teeth, lips, beard, all perfect, only diſcoloured, and a little ſhriveled; likewiſe the pudenda of both ſexes. He ſaw about three or four hundred in ſeveral caves, ſome of them are ſtanding, others lye on beds of wood, ſo hardned by an art they had, (which the Spaniards call *curar*, to cure a piece of wood) which no iron can pierce or hurt. He ſaid, that one day being a hunting, a ferret (which is in uſe there) having a bell about his neck, ran after a coney into a hole, where they loſt the ſound of the bell; the owner being afraid he ſhould loſe his ferret, ſeeking about the rock and ſhrubs, found the mouth of a cave, entring in, was ſo affrighted, that he cried out: it was at the ſight of one of theſe bodies, very tall and large, lying with his head upon a great ſtone, his feet ſupported by a little wall of ſtone, the body reſting on a bed of wood, as before was mentioned.

The fellow being now a little out of his fright, entered in, and cut off a great piece of the ſkin, that lay on the breaſt of his body, which the doctor ſays was more flexible and pliable than ever he felt any kid leather glove, and yet ſo far from being rotten, that the man made uſe of it for his flail many years after.

These bodies are very light, as if made up of ſtraw: and in ſome broken limbs, he obſerved the nerves and tendons, and alſo ſome ſtrings of the veins and arteries very diſtinctly.

His great care was to enquire of theſe people, what they had amongſt them of tradition, concerning the embalming and preſervation of theſe bodies? From ſome of the oldeſt of them (above a hundred and ten years of age) he received this account: that they had of old one particular tribe of men, that had this art amongſt themſelves only, and kept it as a thing ſacred, and not to be communicated to the vulgar; theſe mixed not with the reſt of the inhabitants, nor married out of their own tribe, and were alſo their prieſts and miniſters of religion: that upon the conqueſt of the Spaniard, they were moſt of them deſtroyed, and the art loſt with them, only they held ſome traditions yet of a few ingredients, that were made uſe of in this buſineſs.

They took butter of goat's milk, (ſome ſaid hog's greaſe was mingled with it) which they kept in the ſkins for this purpoſe; in this they boiled certain herbs; 1ſt, A ſort of wild lavender, which grows there in great quantities on the rocks. 2dly, An herb called jara, of a very gummy and glutinous conſiſtence, which now grows under the tops of the mountains only. 3dly, A kind of a cyclamen, or ſow bread. 4thly, Wild ſage growing plentifully in this iſland. Theſe, with ſtones bruiſed and boiled in the butter, rendered it a perfect balſam. This prepared, they firſt unbowelled the corps; and in the poorer ſort, to ſave charges, they took out the brain behind: and theſe poor alſo were ſewed up in ſkins with the hair on, whereas the richer were (as was ſaid before) put up in ſkins ſo finely and exactly dreſſed, as they remain moſt rarely pliant and gentle to this day. After the body was thus ordered, they had in a readineſs a lixivium, made of the bark of pine-trees, with which they waſhed the body, drying in the ſun in ſummer, and in ſtoves in winter, this repeating very often. Afterwards they began their unction with the balſam, both without and within, drying it again, as before: this they continue till the balſam had penetrated itſelf into the whole habit, and the muſcles in all parts appeared through the contracted ſkin, and the body became exceeding light; then they ſewed them

them up in the goat-ſkins, as already mentioned. He was told by theſe ancient people, that they have above twenty caves of their kings and great perſons, with their whole families, yet unknown to any but themſelves, and which they will never diſcover. Laſtly, he ſays, that bodies are found in the caves of the grand *Canaries*, in ſacks, and quite conſumed, not as thoſe in *Teneriff*. Thus far of the bodies and embalming. Anciently when they had no knowledge of iron, they made their lances of wood, hardened as before, ſome of which the doctor has ſeen: he has alſo ſeen earthern pots ſo hard, that they cannot be broken, of theſe ſome are found in the caves, and old barrancos, and uſed by the poorer ſort of people, that find them, to boil meat in; likewiſe they did curar ſtone itſelf, that is to ſay, a kind of ſlate now called tabona, which they firſt formed to an edge or point, as they had occaſion to uſe them, either as knives, or lancets to let blood.

THEIR food was barley roaſted, and then ground with little mills, which they made of ſtones, and mixed with milk and honey; this they ſtill fed on, and carried it on at their backs in goat ſkins.

To this day they drink no wine, nor care for fleſh; they are generally very lean, tall, active, and full of courage.

HE himſelf has ſeen them leap from rock to rock, from a very prodigious height, till they came to the bottom, ſometimes making ten fathom deep at one leap. The manner is thus.

FIRST, they tertiate their lance, (which is about the bigneſs of a half-pike) that is, they poiſe it in their hand; then they aim the point of it at any piece of a rock, upon which they intend to light, ſometimes not half a foot broad; at their going off they clap their feet cloſe to the lance, and ſo carry their bodies in the air; the point of the lance firſt comes to the place, which breaks the force of their fall; then they ſlide gently down by the ſtaff, and pitch their feet upon the very place they firſt deſigned, and from rock to rock, till they come to the bottom.

THEIR novices ſometimes break their necks in learning. He added ſeveral ſtories to this effect, of their great activity in leaping down rocks and clifts, and how eight and twenty of them made an eſcape from the battlement of an extraordinary high caſtle in the iſland, when the governor thought he had made ſure of them.

HE told alſo, (and the ſame was ſeriouſly confirmed by a Spaniard, and another Canary-merchant then in the company) that they whiſtle ſo loud, as to be heard five miles off; and that to be in the ſame room with them when they whiſtle, were enough to endanger breaking the tympanum of the ear: and added, that he being in the company of one, that whiſtled his loudeſt, could not hear perfectly for fifteen days after, the noiſe was ſo great.

HE affirms alſo, that they throw ſtones with a force as great as that of a bullet, and now uſe ſtones in all their fights, as they did anciently.

MR. *Sydenham* told me this day, that upon the 18th of *Auguſt*, he and his company began their journey toward the pike of *Teneriff*, ſetting out from *L'Oratava*, a town ſeated on the lower part of the mountain, from which town to the ſea there are three miles of way always deſcending.

HE began his journey on ſunday about 10 a clock at night, and travelled till five in the afternoon of the monday following, reſting two hours by the way; the ground was continually riſing, and during this time they travelled about 10 miles of their way upon mules.

RESTING upon monday till 12 a clock at night, they reſumed their journey, and travelled till about 9 in the morning, at which time they arrived at the top of the ſugar-loaf, or higheſt pile of the mountain.

THEY went up on the ſouth ſide of the hill, on which ſide there was no ſnow, though on the north ſide there were much. They ſtayed about two hours on the top of the ſugar-loaf, and then returned to that part of the hill, where they had lodged the night before.

I ASKED Mr. *Sydenham*, what was the eſtimate made by the moſt knowing perſons of the iſland, of the height of the hill? and he told me, that the guides accounted it to be one and twenty miles high from the town, which, as was noted before, is ſeated three miles above the ſea. And he added, that a ſeaman with great confidence affirming himſelf to have accurately enough meaſured by obſervations made in a ſhip, and to have found the perpendicular height of the hill to be about ſeven miles.

I ASKED him alſo from what diſtance the top of the ſugar-loaf could be ſeen at ſea, according to the common opinion of ſeamen? he anſwered, that the diſtance was wont to be reckoned threeſcore ſea-leagues, of three miles to a league, adding, that he himſelf had ſeen it above forty leagues off, and yet it appeared exceeding high, and like a bluiſh pyramid, manifeſtly a great deal higher than the clouds. And he alſo told me, that ſometimes men could from thence ſee the iſland of *Madeira*, though diſtant from it 70 leagues; and that the great *Canary*, though 18 leagues off, ſeemed to be very near them, as if they might leap down upon it.

HE told me, that the higher part of the region of ſnow was two miles, or two miles and a half lower than the foot of the ſugar-loaf; and that on the upper part of the hill they felt no wind.

MR. *Sydenham* told me, that being at the top of the ſugar-loaf, drinking the king's health, he endeavoured to ſhoot off a birding-piece he had carried up with him, but though he ſnapped it above twenty times, he could not make it go off; whereas when he came down into the ordinary air, the firſt time he tried to ſhoot, it went readily off. I aſked him, whether he had taken notice, that the flint

ſtruck

ſtruck out any ſparks of fire or no at the top of the hill, and whether he had mended and altered the flint coming downwards? To the firſt he anſwered he did not remember; to the other, that he remembered he did not.

He alſo told me, that having carried up a borracha of ſack, when they came to the top of the mountain, they drank divers healths very freely, but could not find themſelves heated, or ſenſibly diſcompoſed by the wind; whereas when they were come down into a thicker air, they manifeſtly felt the heady operation of the liquor, which then made their guide and one of their company drunk.

He deſcribed the ſugar-loaf to be in the midſt of a barren plain, in the upper part of the mountain, and to be exceeding ſteep. The top of the ſugar-loaf is made ſhelving inward almoſt like a diſh. But in many places of it there appear little holes (regularly placed) as it were ſo many little vents to a great fire burning in or below the bowels of the mountain. He told me, that the guide diſſuaded him from going to the middle of this ſhelving top, affirming it to be exceeding dangerous: but he ventured to thruſt the ſcouring ſtick of his gun ſomewhat deep and rudely into one of thoſe holes, from whence there aroſe a hot ſteam, which had like to have killed him, and hindred him from further trials. He added, that the top of the mountain ſeemed to be little elſe than ſtones and ſulphur, and that there were great ſtore of pieces of brimſtone, which are gueſſed to be ſublimed up from the internal parts of the hill.

Being aſked, whether he was ſick or no in the aſcent? he ſaid, that both he and all his company, which were about a dozen men, were ſick for three or four hours, when they came into the ſubtile and piercing air of the upper part of the mountain; but as they went down again, they were not ſick. And being aſked, what kind of ſickneſs it was they felt? he ſaid, it was like ſea-ſickneſs.

He told me, that the ſack they carried up with them to refreſh themſelves, ſeemed to them at the top of the mountain ſo very cold, that they were not able to drink above two or three drops at a draught, by reaſon of the operation of the exceſſive cold upon their teeth. He added upon my enquiry, that his feet were not more than ordinarily warm, and yet one of the two pair of pumps he carried up with him were burnt off his feet by the brimſtone.

When I aſked him about the difference of ſeaſons at the ſame time in the ſame mountain, he told me, that he paſſed over one of them by name.

On the one ſide of which it was exceſſively hot near the top or ridge, as well, though not quite ſo much, as in the lower regions on the ſide of the mountain; but within a mile or two on the other ſide of the ridge he found winter-weather, as to cold and ſtormineſs, and yet there was ſnow as well on the other ſide as on this.

To what depth the water will be frozen in hard winters.

To what depth the earth will be frozen in that ſeaſon.

Whether Muſcovian ice be conſiderably, or at leaſt ſenſibly harder than Engliſh ice.

Whether by caſting up water, or by ſpitting, the liquor will freeze before it comes to touch the ground.

Whether brandy, ſack, *&c.* will freeze in *Ruſſia*.

Whether inſtruments of iron and ſteel be much more brittle there than here.

Of the cracking of the timber in wooden houſes, and the cauſes of it.

Of the preſervation of fleſh, fiſh, herbs, eggs, *&c.* in hard weather.

Of the curing of thoſe whoſe noſe, cheeks, *&c.* are frozen.

Of the ſymptoms of thoſe, that are frozen to death.

Of the keeping of dead bodies.

TITLE XX.

Of the air in reference to light, its perſpicuity, opacity, reflections, refractions, colours, light, and lightning.

A very learned traveller affirmed to me, that having occaſion to reſide ſometimes on the *Riviera* or coaſt of *Genoa*, he had often obſerved, that from a high place he could both morning and evening clearly diſcern the iſland of *Corſica*, and ſometimes alſo other places in that ſea, though he could not ſee them at noon, how fair and clear ſo ever the weather was, when the ſun was in or near the meridian.

His late majeſty king *Charles* the ſecond, doing me one day the honour to diſcourſe about ſeveral marine obſervations, was pleaſed among other things to acquaint me with this rare phænomenon. He was one day walking upon the beach on the ſtrand, not far from *Dover*, to enjoy the freſh air, and the proſpect of the ſea, when caſually looking forwards to the verge of the viſible horizon, he was very much ſurpriſed to diſcover there a new coaſt, with riſing and falling grounds, newly, as it were, emerged out of the ocean, in a place, where no ſuch thing had been ſeen before. The ſtrangeneſs of this unlooked-for apparition made him ſuſpect ſomething of illuſion offered to his eyes by the beams of the ſun, that ſhone upon the neighbouring objects; wherefore he rubbed his eyes, and the new ſcene not vaniſhing, he called to his royal highneſs the duke of *York*, (who was preſent when his majeſty was pleaſed to make me the relation) and to ſome of the attending courtiers, that were neareſt at hand, to make them partakers and witneſſes of this delightful ſpectacle, which, after it had been gazed on a little while, did ſomewhat ſlowly diſappear, as if it had ſunk down again into the ocean. Of the cauſe of this rare phænomenon, I ventured to propoſe to the king this

conjecture: that the place, where it was ſeen, lying the ſame way that the coaſt of *France* did, and that coaſt being but a little too far off to be diſcerned before, it might very well happen, that either by action of the ſun, or rather by ſubterraneal ſteams, the air interpoſed between the ſhore and his majeſty's eyes was filled with vapours and exhalations, that made it much more refractive than formerly; and by help of this ſupervening refraction, the French coaſt, that lay beyond it was raiſed, and as it were lifted up, in reference to the ſight, and ſo became viſible as long as that new refraction laſted: and when the ſteams, that occaſioned it, were either got up too high, or were by the winds or ſun too much diſſipated or diſperſed, the apparition ceaſed, together with the unuſual refraction that cauſed it. And in favour of this conjecture I alledged that familiar experiment, in which a piece of gold, or the like convenient object, being put into the bottom of an empty cup, and the eye being ſo placed, that the object is but juſt hid from it by the interpoſition of the ſide of the cup, if water be poured into the veſſel, though neither the eye nor the object be at all removed, yet the piece of gold will be plainly ſeen, becauſe the ſurface of the water, which is a thicker medium than the air, breaking the rays, that tend from the object towards the beholder's eye, according to the laws of refraction, that is from the perpendicular they are ſo bended, that thoſe fall now into the pupil, that, if it were not for the water, would either fall upon the ſide of the cup, and ſo be hindered from paſſing forward; or elſe would fall upon the eye-lids or eye-brows, or ſome other part above the pupil, and ſo would not make the object viſible.

The duke of *York* was alſo pleaſed to tell me, that he was ſomewhat ſurprized, when being near the borders of *Scotland*, in a ſeaſon, that did not promiſe much fair weather, he ſaw one morning the ſky very red, and thereupon ſaid, that he feared they ſhould have foul weather, according to the uſual prognoſtick of countrymen and mariners: but ſome of the Scotiſh nobility, that attended his highneſs, told him, that in that country ſuch red mornings did not bode a foul day, but rather promiſe a fair one, which prediction of theirs was juſtified by the event. Upon which occaſion I enquired of a very intelligent Scotiſh nobleman, how far the obſervation held in his country? to which he anſwered, that with a due limitation it was moſt commonly true; for though when the redneſs ſeems to be very near the ground, and appears in ſomewhat narrow ſtreaks of an intenſed red, it ſignifies bad weather; yet if the morning redneſs appears elevated in the air or ſky, eſpecially if the wind be eaſterly, it uſually foretels a fair day.

Some obſervations of capt. James, *in his northern voyage, Mr.* J. T. *and others.*

February. I practiſed ſome obſervations by the riſing and ſetting of the ſun, calculating the time of his riſing and ſetting, by very true running glaſſes. As for our clock and watch, notwithſtanding we ſtill kept them by the fire-ſide in a cheſt, wrapped in clothes, yet were they ſo frozen, that they could not go. My obſervations by theſe glaſſes I compared with the ſtars coming to the meridian: by this means we found the ſun to riſe twenty minutes before it ſhould; and in the evening to remain above the horizon twenty minutes (or thereabouts) longer than it ſhould do: and all this by reaſon of the refraction. Captain *James.*

March. This evening the moon roſe in a very long oval alongſt the horizon.

April. The weather continued with this extremity until the fifteenth, at which time our ſpring was harder frozen than it had been all the year before. I had often obſerved the difference betwixt clear weather and miſty refractious weather, in this manner: from a little hill, which was near adjoining to our houſe, in the cleareſt weather, when the ſun ſhone with all the purity of air that I could conceive, we could not ſee a little iſland, which bare off us ſouth ſouth-eaſt ſome four leagues; but if the weather were miſty (as aforeſaid) then we ſhould often ſee it from the loweſt place. This little iſland I had ſeen the laſt year, when I was on *Danby* iſland. The 13th I took the height of it inſtrumentally, ſtanding near the ſea-ſide, which I found to be 34 minutes, the ſun being 28 degrees high. This ſhows how great a refraction here is. Yet may this be noted by the way, that I have ſeen the land elevated, by reaſon of the refractious air, and nevertheleſs the ſun hath riſen perfect round.

January 6. I obſerved the latitude with what exactneſs I could, (it being very clear ſun-ſhine weather) which I found to be 51, 52. This difference is by reaſon, that here is a great refraction.

January 21. I obſerved the ſun to riſe like an oval alongſt the horizon; I called three or four to ſee it, the better to confirm my judgment, and we all are agreed, that it was twice as long as it was broad. We plainly perceived withall, that by degrees as it got up higher, it alſo recovered roundneſs.

Attending upon Sir *Peter Wych*, in his journey for *Warſaw* the beginning of *June* $16\frac{59}{60}$, whilſt we lay about three Poliſh miles from the city, attending the preparations for his reception there, we had very clear and extreme cold weather; and for two days together we obſerved the ſun and two parhelions, or three ſuns, from above ten a clock to near twelve, not the leaſt cloud appearing in the air, but that ſo ſerene, that we took notice of the icy ſpangles in the air, flying about like atoms in the ſun's beams. This is alſo worth taking notice of; that whereas in ordinary frofty weather any ſmooth iron, or other metal, whether heads of ſticks, pomels of ſwords, or barrels of guns, being brought out of the open air into a warm room, there will preſently, firſt a dulneſs in the glaſs, and then drops of water appear: at this time

there would immediately appear the likeneſs of an hoar froſt. Now, whether the particles of cold be ſo ſubtile as to pierce or enter into poliſhed metal, I will not determine; though the experience of wetting one finger with his ſpittle, and forthwith laying it to iron, when it freezes hard, by its immediate adheſion, even in the moment of touching it, would make ſome way for the affirmative. That ſame month returning back from *Warſaw*, I ſaw, upon my journey, the ſun riſe with a large pillar, coloured like a rain-bow, perpendicular over it, out of a clear horizon; and I remember monſieur *Hevelius* told me, he obſerved it once ſet with the like, N.

In *Cornwall* they obſerve in their driving home levels or ſink, the waters do alſo manifeſtly partake of the minerals, for in ſome mines they are ſanative, where iron is obſerved; and in others apt to cauſe wounds to feſter and rankle. As the firſt was moſt manifeſt at *Karne-Key*, the latter at *Reliſtian*, both famous tin-works.

Asking of a chemiſt, that travelled with a famous virtuoſo of my acquaintance over part of the *Alpes*, that is ſaid to be much ſubject to thunders, divers queſtions about thunder, I had, among other anſwers, this, that he and my friend being together at the top of a forked mountain, between whoſe parts there lay a valley, that ſeemed almoſt covered with a thick cloud; and though the weather were clear at both the tops, he obſerved, that the ſubjacent cloud being big with thunder, the lightning appeared quite through it, and ſeemed to lye deep in it, ſo that caſting his eyes down upon the cloud, he fancied, that what he ſaw, was (to uſe his own compariſon) as if a ſhining fiſh were moving to and fro very ſwiftly in a ſomewhat troubled water. If I had ſeaſonably had the relation, I had enquired of my friend about it; but I was the more inclined to believe it, becauſe I remember, that paſſing over a part of the *Alpes*, leſs high than that where the recited obſervation was made, though it was very fair weather, and a clear ſky at the top of the mountain where we were, yet a great way beneath us we ſaw dark clouds, through part of which we afterwards in our deſcent were obliged to paſs, though then (whether part of the matter had been in the mean while diſcuſſed, I examine not) it ſeemed to us little different from a thick fog, which when we had paſſed thorough, we found the weather fair and clear enough to the foot of the mountain.

Meeting with an inquiſitive nobleman, that lived long at *Naples*, I aſked him, whether he had ever ſeen any of thoſe famous apparitions, that are ſaid ſometimes to ſhew themſelves in or near the *Sicilian* ſtreight, and is known by the name (if I miſtake not) of *Morgane?* to this he anſwered me, that during the ſpring-time, he had once the curioſity to try, whether this tradition had ſo much ground as was commonly believed; and that accordingly on ſeveral fair mornings he roſe before the ſun, and looked ſolicitouſly along the coaſt, without ſeeing any thing that anſwered his expectation: but not being diſcouraged by theſe diſappointments, he one morning perceived, as he thought, two ſteeples in a neighbouring town, where he knew there was but one; which phænomenon inviting him to continue his curioſity, he choſe the firſt fair and cloudleſs morning to riſe early on; and caſting his eyes towards the lately mentioned town, and the coaſt it was not remote from, he was ſurpriſed with a delightful proſpect of a new town beyond the other, and incomparably greater than it, and furniſhed, as it ſeemed to him and a doctor of phyſick that accompanied him, with walls and towers, and ſteeples and houſes, and other things, that were delightful, as well as wonderful to behold. But he anſwered me, that the colours were not near ſo lively as the figures, being for the moſt part ſomewhat dim, though adorned here and there with ſome redneſs: but this odd ſpectacle, as it was not invariable during the whole time it laſted, did not continue very long; for when the ſun was gotten up to ſuch a height above the horizon, as made his beams powerful, they quickly confounded all theſe airy ſtructures in a kind of chaos, and made the fantaſtick city vaniſh.

Moist vapours are not the only cauſe or ſign of the opacity of the air, ſince that dry blighting eaſt wind, which from the effects country people call a red wind, makes the air at a diſtance ſeem bluiſh and thick. This is the wind, which theſe two years laſt paſt has been ſo pernicious to apples, and indeed to all ſorts of trees, not only to blaſt the fruit, but the very leaves of ſuch trees as it met withal, juſt in the tender (as the woodmen call it) *i. e.* when they are newly expanded out of the buds. Mr. *J. T.*

That air is ſometimes more clear and tranſparent, and ſometimes more dark, and, as it were, muddy, being clogged and opacated with terreſtrial ſteams, is every man's obſervation. But there are ſome phænomena, that depend upon the denſity, diaphaneity, *&c.* of the air, that are not ſo vulgarly taken notice of: for beſides thoſe, that require ſkill in the doctrine of refractions, on which therefore I ſhall not now inſiſt; there are ſome others, that may be worth your notice, which I ſhall give a taſte of.

Considering the differing accounts, that are given by good authors, of the number of the fixed ſtars, and comparing them with ſome obſervations of our own, I was thereby, and upon ſome other grounds, induced to ſuſpect, that the differing and unheeded conſtitutions of the air might occaſion a difference in aſſigning the number of the ſtars; which made me enquire of ſeveral navigators and travellers, ſome into the torrid zone, and others into the frigid ones, what difference they found in contemplating the ſtars in thoſe climates, and in ours; and by this enquiry, I learned, that in ſome places, where the air is very pure, celeſtial obſervations may be more happily made. And particularly becauſe I

ſuppoſed, that intenſe cold, by precipitating the darkning vapours out of the air, may probably make it more defecate and clear, I deſired an ingenious phyſician, that travelled in *Muſcovy*, to take notice of any thing, that ſhould favour or disfavour this conjecture. In compliance with which requeſt of mine he informed me, that travelling one night in a ſled in the more mediterranean parts of *Ruſſia*, the weather being extraordinary cold, he was invited to quit his ſled a little to conſider the ſky, where he ſaw ſo many ſtars, and ſo much brighter than he had ever ſeen before, that he was almoſt as much ſurpriſed as delighted with ſo glorious a ſpectacle, which he ſhewed to ſome of his fellow-travellers, that ſhared in his wonder.

And this brought into my mind, that remembring, that the ingenious captain *James* being forced to winter in *Charlton* iſland, which, though but of the latitude almoſt of *Cambridge*, is but little, if at all, leſs cold than *Nova Zembla* itſelf, I ſhould probably find ſomething pertinent to our preſent ſubject in ſo diligent an obſerver. I reſorted to his voyage, where I met with theſe notable obſervations.

January 30 and 31, there appeared in the beginning of the night more ſtars in the firmament than ever I had ſeen before, by two thirds. I could ſee the cloud in cancer full of ſmall ſtars; and amongſt the Pleiades a great many ſmall ſtars. About ten a clock the moon did riſe, and then a quarter of them was not to be ſeen. The wind for the moſt part of this month hath been northerly, and very cold, *&c.* Captain *James*, p. 62.

The Ruſſian emperor's phyſician confirmed to me, by word of mouth, what he had ſome years ſince told me in a letter, that one night, which was exceeding cold and clear, being awakened out of his ſleep by a ſhake, that had like to have overturned his ſled, he looked out and ſaw more ſtars by far than ever he ſaw in *England*, or the neighbouring parts of *Europe*, and particularly, that he ſaw many about the ſeven ſtars, or the Pleiades, and divers others he had not ſeen before in ſeveral other parts of the ſky. He farther told me, that theſe ſtars ſeemed far more beautiful and bright than was uſual, inſomuch that he doubts not, that if it had not been for the ſnow, ſome of them would have caſt a diſcernible ſhadow. For confirmation, he ſaith, that the phænomena were not only taken notice of by him, but by others, that travelled with him; and that though he often gazed at the ſky, ſince that time he never could ſee there near ſo many ſtars, nor ſo bright.

December 4. I had not time the laſt week to tell you of ſomething, that to us, that have not been long in this country, ſeems ſtrange, but the people of this place ſay happens very often.

On the 29th of the laſt month, after I had written and ſent away my letters, looking out of the ducheſſes's window, to ſee what weather it was, I ſaw towards the N. E. alongſt the horizon, it looked as light, and juſt as if it had been break of day, (it was then about a quarter paſt eleven) and gave as great a light: I went then into the drawing-room, and looking out of that window, could look more northerly, and ſaw it was more light due N. and ſaw ſeveral ſtreaks of light, like the tail of a blazing ſtar, all pointing N. and S. one of which was as long or longer than that we ſaw laſt year, for it reached from the horizon, and paſſed between *Charles*'s wain and the N. ſtar, and reached up juſt over our heads. The ſmall ones ſometimes diſappeared; and then we ſaw others of the ſame dimenſions appear in other places; they were all near the great one; two of them ſeemed as if their light had come from the two guards in *Charles*'s wain; and when they vaniſhed, others appeared more ſouth. I went to the other ſide of the houſe, and ſaw that the light reached from the W. or W. N. W. by the N to the E. or E. N. E. I did not go out, becauſe it blew very hard, and was very wet, contenting myſelf to ſee it out of the houſe; but ſent *Geo. Man* up the hill, who ſaw the ſame, and it was ſo clear they could ſee the Frith.

About the new moon before, there was ſuch a light as this ſeen by lord *Belcarras*, as he came in the night from St. *Andrew*'s to his houſe, and by the ſeamen of the yacht at *Leith*, and by ſome here in town: but though the ſky was not then ſo clear, there being broken clouds, yet it gave ſuch light, as they could read very plainly, as they told me: that began about 7, and laſted till 9. This laſt I did not ſee till after 11, and at a quarter of 12 it began to leſſen, at which time I went to bed, and the tails were then no more to be ſeen. Tell Dr. *Flamſtead* of this, and know of him, whether he has ſeen or heard of ſuch kind of things.

This was from his royal highneſs the duke of *York*, then high commiſſioner in *Scotland*.

An intelligent gentleman, that lived in *Africk*, being aſked by me, how far off he was able to ſee the top of the *Pico* of *Teneriff* at ſea? replied, that by the eſtimate of the captain of the ſhip, it was near 50 leagues, and yet it appeared to him ſo high above ſome clouds, and ſo near, that he was fain to caſt his head up to ſee it.

TITLE XXI.

Of the operation of the air on the conſiſtency of animal ſubſtances.

As on the one ſide the ſchools teach the air to be a ſimple and elementary body, that is, only hot and moiſt; ſo on the other ſide, the generality of men are ſo accuſtomed to judge of things by their ſenſes, that not finding the air to be a viſible body, they aſcribe leſs to it than even the ſchoolmen do; and what is inviſible, they think to be next degree to nothing. And indeed both the one ſort of men and the other are wont to conſider the air only as a receptacle, that barely harbours the viſible and palpable bodies committed

mitted to it, or as it were depoſited in it, without acting upon them, unleſs it be perhaps a little upon the account of its manifeſt qualities, heat and moiſture. But for my part, who look upon the air under another notion, and think it may as well alter as receive the bodies, that lye expoſed to it; I am apt to allow it, in reference to ſome bodies, certain other faculties and powers, among which ſome may be called generative and maturative, and others corruptive; and this not only in reſpect of animals and other bodies of a ſlighter texture, but even of ſalts and minerals themſelves.

An obſerving man, that had ſailed to and fro between *Europe* and the *Eaſt-Indies*, anſwered me, among other things, about their way of tranſporting cheeſe; that the cheeſe they uſed to take along were *Cheſhire*, of a very conſiderable thickneſs, which they incloſed in leaden boxes fit for them, and thereby were able to preſerve them ſound till they came to the *Eaſt-Indies*. But in caſe they were not able, or neglected to make uſe of ſuch boxes, he ſeveral times obſerved, that cutting a cheeſe in two, when they were any thing near the equinoctial, that moſt part of it would be very dry and brittle, and ſeemed as if it were ſpoiled; whereas the parts about the middle were ſo fat and ſoft, as if all the unctuous parts, that were wanting in the dried portion of the cheeſe, had retired thither, and was between cream and cheeſe. Which conjecture was not contradicted by this, that if they cut ſome of them cheeſes, when having left the torrid zone behind them, and had made a good progreſs in the temperate zone, they found their external portion good, and the conſiſtence of the cheeſe uniform enough.

Quere, whether the moiſt particles, that flie in the air, be not the great cauſe of all corruption of bodies, ſince *Acoſta* ſays, that in *Peru*, where it ſeldom rains, all things, like dead bodies, keep a great while uncorrupted? The like may be obſerved of *Egypt*, if it be not to be rather imputed to the nitrous ſalt, with which the air of that country ſo much abounds. Mr. *J. T.*

A man of letters, that divers times croſſed the line in great Portugal ſhips, anſwered me, that when they came near it and under it, he obſerved among other things, that there was a very manifeſt change made in the conſiſtence of their biſket; that moſt of their meat, and even their ſalt fiſh was much impaired, ſo that they were ſcarce able to eat it; and that their pilot, who had been 23 times in the *Indies*, aſſured them, he obſerved, when they came to the equinoctial, that freſh water would not there be at all troubled or ſtinking, but clear and ſweet, as if it were but newly put into the caſk.

Doctor *Stubbes* being enquired of by me concerning, *&c.* told me, that in *Jamaica* the ſilken ſtuffs, that were brought thither, will rot even whilſt they keep their colour, if they be ſhewn to the air; though if they be not ſhewed thereto, but kept up cloſe, they were not obſerved to rot, or be diſcoloured.

TITLE XXII.

Of the operation of the air on the conſiſtency of vegetable ſubſtances.

May 16. We opened a ſmall glaſs receiver ground to a plate of glaſs, in which there had been included for three years and ſome months, (though I know not how many) the half of a lemon cut tranſverſly, together with a mercurial gage: the lemon kept its colour pretty well, and its ſhape very well, ſave that at the orifice the upper part of the pulp was depreſſed, ſeeming as it were dried up by the receſs of the liquor contained in it; which liquor did now ſtagnate upon the glaſs plate. When this began to be diſjoined from the upper glaſs, there ruſhed in, not without noiſe, a pretty deal of external air, which argued, that the air afforded by the included lemon in ſo long a time, had not been near ſufficient to fill the cavity of the receiver. Neither the half lemon nor the liquor had any ill ſcent, or other ſign of putrefaction or corruption; neither of them had the leaſt mould, which gave me a ſuſpicion, as far as it could be grounded upon this experiment, that ſuch a mould, as might have been expected, being (as may be gueſſed by the microſcope) a congeries of a very ſmall kind of vegetables, could not, any more than many greater ones, be produced without the concurrence of the air. The liquor was clear enough, and without fæces, being in colour between brown and reddiſh. It contained an acid taſte; and when I put a little of it upon ſyrup of violets, it turned it to a purpliſh colour; and, which is more, being put upon ſmall fragments (not powder) of red coral, preſently began manifeſtly to corrode them, and that in the cold.

To the heat and piercing moiſture of the air combined together may be referred the obſervation of an intelligent ſcholar, from whom, when I aſked him, what he had taken notice of about theſe qualities, when he ſailed under or near the line, (which he did ſeveral times) he told me, that divers paſtils or lozenges, that he was wont to carry in his pockets, were ſo diſſolved, that they ſpoiled his pockets, and obliged him to cut them out; though the paſtils of the ſame kind did never loſe their old conſiſtence till he came near the equator, nor keep their new conſiſtence after he had paſſed ſome degrees beyond it, but grew ſolid again as before.

TITLE XXIII.

Of the operation of the air on the conſiſtency of mineral ſubſtances.

Inquiring of an ingenious Swediſh gentleman, that was a great dealer in the metals his country abounds with, whether the great cold of ſharp winters in thoſe northern climates had not a ſenſible operation upon iron;

iron; I learned from him, that in the chief copper mine (which he had curiouſly viſited) being to draw up the ore from an exceeding great depth, they faſtned their baſkets, not as they uſe in other mines, to iron chains, but to ropes made of ox or bull-hides; and that chiefly for this reaſon, that during the hard winter-froſts, that are there uſual, the links of their iron chains were very ſubject to be broken by the great cold joined to the weight of the ore, to the great danger, and oftentimes the deſtruction of the poor workmen, that were digging beneath: which inconvenience was avoided by employing leather, which the cold could not make brittle, inſtead of iron.

ASKING an ingenious maſter of a glaſs-houſe, whether he had not obſerved, that glaſſes, though as well nealed as is ordinary, would ſometimes of themſelves break with a noiſe long after; he anſwered me affirmatively; adding, that particularly having one time had an occaſion to lay by, for about half a year or longer, a numerous parcel of glaſſes, when he came to take them out, he found, that about a fourth part of the whole batch was frozen of themſelves; and that in moſt or all of them, the cracks proceeded from ſome ſeeming ſtone or great grain of ſand, which yet indeed was not ſand, but ſome part of ſalt, that had not obtained a ſufficient comminution.

A LEARNED gentleman, that is owner of an iron mine, informs me, that he has a houſe in *Suffolk*, within 6 miles of the ſea; and though the houſe be but 80 years old, yet the iron bars of the window, that look towards the ſea, are ſwelled, and (as he calls it) rotten, being brittle, and eaſy to be crumbled into powder. And when I aſked him, whether the wind, that came from the ſea to theſe windows, were not ſouthern, he anſwered affirmatively. And to confirm what I was ſaying of the operation of ſea-ſalt upon iron, he told me, that having had occaſion to cauſe many bars of iron to be laid in a place upon the neighbouring ſhore, above the high-water-mark, a great ſtorm chanced to increaſe the tide ſo far as to drench thoſe bars for ſome hours after; which remaining in the air, they were very much impaired, great thick flakes being eaſy to be ſtruck off from them, when they came to be hammered.

A VERY experienced maſon informed me, that the cathedral of *Saliſbury* is made of *Purbeck* ſtone, which in the air grows ſofter, and will moulder away; and ſo will ſome *Blechington* ſtone, though not expoſed to wet; whereas the ſtones dug up at *Painſwick*, within four miles of *Glouceſter*, being very ſoft and friable at firſt, will by lying in the air (as he has particularly obſerved) acquire a cruſt hard and glaſſy like marble; and the oftner it is waſhed, the ſooner will it acquire this hard and yellowiſh cruſt, which reaches but a very little way (ſcarce the thickneſs of half a crown) beneath the ſurface contiguous to the air.

TITLE XXIV.

Of the air in reference to fire and flame.

A GENTLEMAN of my acquaintance being aſked by me about the burning of candles in grooves (or ſutts) that are not furniſhed with air-ſhafts, he told me, that the depths I deſired to be informed of were very uncertain, and varied conſiderably, according to the different nature of the ſoil, and perhaps other circumſtances; ſo that ſometimes a candle will go out much ſooner, and ſometimes it would continue burning, though it were let down to the depth of eight, ten, or more fathom. That when they come into cloſe ground, though their candle will burn at firſt, yet after a while working, (more eſpecially if the ſtone be full of mundick) the duſt raiſed by their working will make their candles go out, ſo that they muſt leave working for a time, except they will be at the charge of conveying down air by pipes. I mention this as different from other ſorts of damps. *N.*

Experiments touching the relation between flame, air.

THE burning of candles, *&c.* under a glaſs bell.

THE burning of ſpirit of wine under a glaſs bell.

THE burning of match, touchwood, ſponck, *&c.* under a bell.

THE keeping of animals under the ſame inſtrument whilſt the flame is burning.

THE burning of bodies to aſhes in ſealed glaſſes.

THE doing the like in exactly cloſed receivers.

THE burning of cotton in a ſealed glaſs.

THE burning of the mixture of flames under water in an E. R.

THE burning of ſpirit of wine and oil of turpentine in glaſs veſſels with ſlender necks.

THE experiment of burning gunpowder.

ANOTHER of the piſtols not firing in an E. R.

THE burning of a ſaline ſubſtance in an E. R.

THE burning of mixtures of ſalt-petre in an E. R.

TITLE XXV.

Of the air in reference to fermentation.

WE took a ſmall handful of raiſins, and having put them into a bolt-head, (not large, but half filled with water) we drew out the air, and then we removed Novemb

the

the portable and exactly cloſed receiver, and put it on the digeſtive furnace, that the warmth of that place might promote the fermentation in ſpite of the unfavourableneſs of the ſeaſon of the year. After a while there appeared ſigns of fermentation by the emerging of the raiſins, which ſwam for ſome days on the top of the water, moſt of them beſet with numerous bubbles; nor did above very few of them ſubſide at laſt, though after ſome days the bubbles grew fewer and fewer, and there appeared a ſediment at the bottom of the glaſs.

A FORTNIGHT after they were firſt ſealed up, the upper part of the glaſs was accidentally broken whilſt I ſtood by, whereupon the external air ruſhed in with ſome noiſe: and I taking the veſſel in my hand, perceived the ſurface of the liquor to be overſpread with bubbles, almoſt like the froth of bottle-drink: there ſeemed to me to come out at the little orifice made, where the apex was broken off, a viſible fume, which had a ſomewhat languid ſmell. The liquor was high coloured of the raiſins, and ſeemed to have extracted ſomething from them, that gave it a better conſiſtence than that of water.

TITLE XXVI.

Of the air as the receptacle of odours.

TITLE XXVII.

Of the operation of the air on the odours of animal ſubſtances.

MAY 23. We opened an exhauſted receiver, wherein was pretty ſtore of verjuice, or green and ſour grapes. And though they had lain there, we are ſure, about three years, and poſſibly much longer, yet there appeared no mouldineſs at all upon any of them: but the ſurfaces of the uppermoſt grains were ſomewhat diſcoloured, perhaps by a ſaline and confuſedly formed efflorescence, which having looked upon through a glaſs, and alſo taſted, I gueſſed to be a kind of tartar. The like liquor, that the grains had afforded, had an acid taſte, and would in the cold corrode coral; but the grains ſmelled ſomewhat muſty. In all this time the verjuice had produced ſo little air, that we could ſcarce take notice of it by the mercurial gage, that had been ſhut up with it.

I INQUIRED of my lord of *Sandwich*, and a couple of gentlemen that accompanied him, whether it be true, which is reported of the purity of the air at *Madrid*, that though they have no houſes of office, but every night throw out their excrements into the ſtreets, yet by the next morning there remains no more ſmell of them. To which I was anſwered, that it was true the excrements were ſo diſpoſed of, but that *Madrid* is the ſtinkingeſt town they ever came into; yet that it was difficult to diſcern in the morning any peculiar ſmell of what had been caſt into the ſtreet by night: but they jointly affirmed, that the place, where the embaſſador's numerous family reſorted to make water in, did not ſmell of piſs; and that they often obſerved the dogs and cats, that lay dead in the ſtreets, were deprived of ſtench: and his lordſhip ſuppoſed, that the ſtench of a dead mule would in few hours vaniſh.

TITLE XXVIII.

Of the operation of the air on the odours of vegetable ſubſtances.

MAY 16. At the ſame time we opened another ſmall receiver, wherein above three years before ſome large pieces of orange had been included: the rinds of theſe were much diſcoloured, their ſurfaces being almoſt black. They had ſcarce afforded any liquor, and yet we could not perceive the leaſt mould in any of them, nor had they a putrid ſmell.

TITLE XXIX.

Of the operation of the air on the odours of mineral ſubſtances.

TITLE XXX.

Of the operation of the air on the taſtes of animal ſubſtances.

HE anſwered me, that they could very well preſerve meat, as beef, without ſalting it, as long as the froſt laſted, that is, during the whole winter. But when it was once thoroughly frozen, they could not dreſs it ſo as to make it reliſh like good meat. Mr. *Nickſon.*

TITLE XXXI.

Of the operations of the air on the taſtes of vegetable ſubſtances.

TITLE XXXII.

Of the operations of the air on the taſtes of mineral ſubſtances.

TITLE XXXIII.

Of the operations of the air on the colours of animal ſubſtances.

ENQUIRING of a man of letters, that had the curioſity to travel into the inland parts of *Braſil*, whether in that country the air had not a great influence upon the colours of clothes; he told me it had, and even upon black; inſomuch that a kind of black taffety, which is the uſual wear of the better ſort, will, after it hath been worn a very few days, degenerate into an ironiſh colour: yet he anſwered me, that in the ſhops, where it is carefully kept from the air, the taffety continued of a good black.

NOR is it only upon the colour of ſtuffs, but of animals too, that he ſays the Braſilian air has an operation; for he ſays, that at a place 50 leagues beyond *Parigua*, there is a region, where white People do in a very ſhort time grow baſannez (or tawny) though a little way out of that particular region, as for inſtance beyond it, they quickly recover their wonted colour,

HE told me, that upon *Charleton* iſland they have flocks of certain birds, which the Engliſh there call partridges, though they reſemble ours more in bulk than ſhape, being ſomewhat like wild pigeons, but a good deal bigger: theſe he ſays are white in the winter, and gray in the ſummer.

TITLE XXXIV.

Of the operations of the air on the colours of vegetable ſubſtances.

A LEARNED man, that was phyſician to the governor of *Jamaica*, being at his return aſked divers queſtions by me, concerning that iſland, gave me, among others, the following anſwer. Lignum vitæ, ſaid he, and moſt other trees at *Jamaica*, when they are newly cut down, wherever you cut the wood, that part, which is expoſed to the air, will quickly grow green, though that which is a little beneath it be yellow, or of another colour; and this lignum vitæ, when green, is as ſoft as oak, or ſofter; and many other *Jamaica* woods, that are ſoft, when newly cut down, will afterwards ſo harden in the air, that ordinary tools will make no impreſſion upon them; and the nails, that pierced them eaſily before, can no more be forced out of them; and this is chiefly conſpicuous in the cabbage-tree, which being a wood ſoft enough when it is cut down, the pith, which is very copious, will quickly rot of itſelf, and the reſt of the tree ſerves for a pipe of perhaps 100 foot long, that will not corrupt under ground, but grow almoſt as hard as iron.

ENQUIRING of an inquiſitive traveller, what he had obſerved about the power of the air, which I had been informed was great, in working upon divers bodies at the iſland of *St. Jago*; he told me, that he and his company had not ſtayed long enough there to make much obſervation of that kind; but, that ſeeing aloes growing plentifully there, they had gathered ſome plants of it, whoſe juice he found, as I have here in *Europe*, to be very clammy, and exceſſively bitter, and, which was wondred at, of a very dark colour; but having carried them in the ſhip towards the equinoctial, they found for a time the juice to be altered, having loſt almoſt all its bitterneſs, and acquired a green colour.

STAINS of linen will beſt go out at the time of the year, when the fruits or plants, whoſe juice made them, are in their prime: this a gentlewoman aſſured me ſhe had tried in new linen ſtained with juice of quinces; and the lady *N. N.* affirmed, that ſhe had particularly tried it in ſtains made with the juice of hops, which ſhe ſays are the worſt ſtains of all; and which having in vain tried to get out of her linen, ſhe laid up her linen in her cheſt, and at the time of the year, when hops flouriſh, ſhe found the ſtains vaniſh of themſelves.

TITLE XXXV.

Of the operations of the air on the colours of mineral ſubſtances.

A CONSIDERABLE inſtance of the changes, that the contact of air is able to produce even upon ſolid minerals, I gave thoſe, that ſaw it, by the following experiment. We took one part of lapis calaminaris, and about four parts of good ſalt-peter; theſe being well powdered and mixed, were put into a ſtrong crucible, and kept in a vehement fire ſome hours, by which means the matter, as we expected, was alcalized: upon the thus prepared lapis calaminaris we poured a convenient quantity of fair water, which afforded us a ſolution, that was ſomewhat muddy, but appeared of a deep red: this we poured into a wide-mouthed glaſs, which we ſet in a window, that it might be the more acceſſible to freſh air. There, after a while, our darkiſh red ſolution turned quite green, and more diaphanous than before; but, continuing for ſome days to keep the glaſs in the ſame window (which reſpected the ſouth) we found our green ſolution to loſe its colour by degrees, and at laſt to be reſolved into a tranſparent liquor, and a ſubſiding powder, that was not at all green, but red, or like brick-duſt. Theſe

changes

changes of colour ſucceeded in more than one parcel of our mineral ſolution.

We took a very ſtrong ſpirit of vinegar, and boiled it a while on crude filings of copper, without finding, that it was manifeſtly coloured by that operation, nor yet by letting it lye ſome hours in the ſame glaſs egg, wherein it had been boiled. Wherefore, ſuppoſing this want of coloration to depend upon the air's not co-operating in the beſt manner it might eaſily be made to do, we poured the liquor and the filings together into a broad flat glaſs (which we placed in a window ſhelving) ſo that though the filings were wet, yet but one part of them was covered to any depth by the menſtruum. This done, we obſerved, as was expected, that the filings, expoſed to the air, changed colour, and became of a greeniſh blue; whilſt thoſe, that were under the liquor, manifeſted no change of colour, but kept that, which belongs to copper, till the menſtruum evaporating by degrees, they alſo being acceſſible to the air, acquired the ſame colour with the former vinegar. Q. Whether in a longer time the coloration would not have been made?

We took ſome filings of copper, and divided it into two parcels; one we put into a flat and ſhallow glaſs with a wide mouth, and the other into a glaſs vial, whoſe neck was of the breadth uſual to ſuch veſſels. Upon each of theſe parcels of filings we poured a convenient quantity of one and the ſame ſtrong ſolution of ſal armoniac made in fair water, and without covering each of the veſſels, let them ſtand by one another for a competent time. Of which trial the event was ſuch as was expected; namely, that the liquor in the vial was but faintly coloured, when that in the open glaſs, that had a large ſurface expoſed to the free air, was very richly tinged. And this circumſtance is not to be forgotten, that whereas all the lower part of the ſolution was of a deep blue, almoſt like ultra-marine, that part, which was contiguous to the air, was covered over with a kind of film like thin ice, which was of a very differing blue, exceeding like that of the finer ſort of turquoices.

We took two ſmall parcels of filings of copper, and put each of them into a ſmall piece of paper, with the edges turned upward, and then put upon each of them three drops of good ſpirit of ſal armoniac. One of theſe papers we left in the window; the other we put into a ſmall receiver, which, by help of our engine, was emptied in little more than a minute of an hour. At the end of two minutes, after the putting on of the ſpirit, there appeared a manifeſt blue on ſome parts of that paper, that was left in the window; but that, which was in the exhauſted receiver, being deprived of the air, that ſhould befriend its operation, continued there full a quarter of an hour or more (by a minute clock) without appearing to be at all coloured: wherefore taking off the receiver, we removed the paper to the ſame window, where the other ſtood, and within about two minutes it began to diſcloſe a blueneſs, which within about two minutes more was conſiderably heightned.

Into a ſlender vial, wherein we put a convenient quantity of the volatile or urinous ſpirit of the lees of wine (elſewhere by us deſcribed) which was of a yellow colour, we let fall ſome filings of copper; and ſtopping the glaſs well, we drew a tincture, which according to expectation was manifeſtly green, but not of the pleaſanteſt and moſt tranſparent ſort of green liquors: then ſuffering the vial to reſt in a window for many days, we obſerved, that the liquor did then but ſlowly return to a yellow colour, which when it had acquired, without any mixture of greenneſs, we opened the vial for a very little while to let in the air, and then ſtopped it well again; the admitted air quickly began to change the ſurface of the liquor into a green colour; which, though ſlowly, extended itſelf downwards, till it had tinged the whole liquor. This colour afterwards, by long ſtanding, did by degrees grow to a pale yellow.

The 19th of *Auguſt* preſented me with ſome phænomena, that made me almoſt deſpair of reducing all thoſe of our variable liquors to a ſettled theory. For coming that day at about ten a clock in the forenoon to a cloſet, where I kept ſeveral vials furniſhed with this liquor, I perceived one of them, that ſtood in the window, that had once almoſt quite loſt its colour, to have re-acquired a very fair blue, at leaſt as deep as that of the ſky in a fair day. This vial I the rather watched, becauſe I had taken notice, not without ſomewhat wondring at it, that for two days before, inſtead of loſing, according to cuſtom, the little remains of colour, that after many days ſtanding is yet retained, the colour began again to increaſe, though the vial were conſtantly kept ſtopped as before; and that, which made this regaining of the colour ſeem more ſtrange, was, that there ſtood juſt by it another vial furniſhed with the ſpirit, and with filings taken out of the ſame parcels, yet the liquor of this parcel continued colourleſs. Wherefore, ſuſpecting, that ſome accident might have happened, whereby ſome little portions of air might have inſinuated themſelves thorough the cork of the altered liquor, I caſt up my eyes to another vial, that ſtood in ſo high a place, that it was not eaſy to reach it, and where it had long reſted, and loſt its colour: but upon this view I was confirmed, that the change lately mentioned in one of the vials was not from the cork, but from ſome unobvious cauſe: for though this upper vial was furniſhed with a good glaſs ſtopple; yet the liquor it contained was again grown cæruleous, though the liquor of another vial, that ſtood juſt by it, continued colourleſs. Wherefore, to ſatisfy myſelf farther, I preſently went to a private place, where I had in a cavity made in the thickneſs of a wall ſet aſide two vials, that ſeveral days before had quite loſt their colour; and my former ſurprize was increaſed, when I found that one of them, which was ſtopped with a cork, continued colourleſs; yet the other that had a glaſs ſtopple, and ſtood juſt by it, had regained a fair

cæruleous colour. Both theſe were fitted for trial, with the ſame ſpirit and filings, and the ſame day with the others abovementioned; and the heat of the weather had ſo little influence upon this effect, that this day was remarkably cold, being made ſo by a northern wind, which made me obſerve it more ſo than I had found it for ſome time before.

I MUST not forget on this occaſion, that I was invited by the foregoing phænomena, to look upon ſome ſpirit, not oil of amber, that I had kept in a vial for ſeveral days upon filings of copper, and had ſometimes expoſed to the air by unſtopping the glaſs, and found, that though formerly the ſpirit kept its native colour better than I deſired, yet it had acquired a green colour, which whether it will loſe again by longer ſtanding, time muſt determine.

THE ſlender vial, with ſpirit of honey, mentioned N°. the though it had been wont to exchange its yellow colour for a blue, by the contact of the external air in a very ſhort time, and ſometimes within a minute or two; yet being opened this afternoon, in the ſame place where it uſed to be ſo, did not in above an hour's time turn blue, but remained a tranſparent yellowiſh colour.

THE vial, with a glaſs ſtopple, mentioned N°. 945. being for divers weeks left unſtirred in the window where it ſtood before, I ſeveral times obſerved it to loſe and regain colour; and though ſometimes it would only appear of a more faint or a more rich blue, yet ſometimes alſo it would appear either quite or almoſt colourleſs, and, perhaps, in a day or two after it, would be again as blue as the ſky. And this, though I could not find, that any thing in the weather was the true cauſe of this change, ſince the liquor would not only gain, but loſe colour in colder weather; and ſo it would alſo do in warmer: but on Michaelmas day I found it to have attained a deep blue; and though ſince it has been now and then ſomewhat more dilute, yet during all the paſt month of *October*, I remember not to have ſeen it any thing mere colourleſs; and this day being the firſt of *November*, I found it to have reſumed a high colour, though a vial with a glaſs ſtopple, which had for many weeks ſtood juſt by it, and formerly did divers times correſpond with it in its changes, has continued all the laſt month of a very pale blue, without either deepning its colour, or growing quite colourleſs.

AN inquiſitive gentleman of my acquaintance, being aſked by me about a mountain in *Wales*, called where ſolid ſtones are ſaid to change their colour very oddly, told me, that within ſight of that hill, in a large piece of ground, that was then newly put under tillage, he ſaw good numbers of ſtones that looked like flints, and were full as hard, if not harder; the colour of moſt of them was dark, the reſt gray: theſe ſtones, which, when the ground was newly turned up, were ruſt-coloured, he obſerved afterwards to grow lighter and lighter coloured; ſo that after three or four years, being invited by this obſervation to take notice of it at his coming to that place again, he found theſe ſtones almoſt all of them turned white. About which phænomenon, queſtioning the ancient inhabitants, with ſome expreſſions of wonder, they ſeemed to make little of it, and aſſured him, in the neighbouring mountain, almoſt all the ſtones, that were expoſed to the air, underwent the like changes, and within a few years were blanched.

HAVING put ſome *mercurius ſublimatus dulcis*, and *vitriolum Romanum* (tied up in ſeveral papers apart) into one box, at the end of twenty two months I found the ſublimate mercury wholly changed into a ſubſtance ſo like antimony, that ſome not ignorant of the *materia medica* have taken it for the ſame; and the ſuperficies only of the vitriol had acquired the ſame colour, but was not at all altered within. This from a credible relator.

TITLE XXXVI.

Of the air deſtroying or introducing other leſs obvious qualities into animal ſubſtances.

TITLE XXXVII.

Of the air deſtroying or introducing other leſs obvious qualities into vegetable ſubſtances.

AN intelligent gentleman, that ſtayed a year in *Guinea*, related to me, that he and his company found the great heat and moiſture of the air to diſpoſe bodies ſo to putrefaction, that he obſerved the white ſugar to be ſometimes full of maggots; and found, that divers drugs, ſalves, and other medicinal things that were brought with him, had quite loſt their virtue; and ſome of them, eſpecially ointments, were verminous. And he added, that in the iſland St. *Jago* (one of thoſe of Cabo-verde) they laid ſtore of ſweetmeats upon tables to the heat of the ſun, to dry up the ſuperfluous moiſture, which in ſtrange abundance they had contracted the preceding night, which otherwiſe would quite ſpoil the ſweetmeats, and bring them to putrify.

OXFORD, though ſeated for the moſt part of it on a gravelly hill, I have known to be very diſagreeable to ſome moiſt ſplenetick and valetudinary bodies, whom I have heard complain, that they could not be ſo well there as elſewhere, eſpecially in the ſpring; ſo that I take the air of that place to be generally moiſt. Mr. *J. T.*

AIR too dry, though ſufficiently hot, is not favourable for the production of divers inſects; for I have obſerved theſe two laſt dry ſprings, that there have been no ſoft garden-ſnails to be found abroad, and very few fleas bred

bred in the houſe, which I impute to extraordinary long drineſs of the air, for want of moiſt vapours to nouriſh them; ſince in wet ſummers we always ſwarm with ſnails, gnats, fleas, &c. whereas this year we have few or none.

TITLE XXXVIII.

Of the air deſtroying or introducing other leſs obvious qualities into mineral ſubſtances.

Zwelfer, pag. 800. *OBSERVANDUM etiam, quòd antimonium diaphoreticum quocunque modo, ſive cum ſolo nitro aut addito etiam tartaro, paratum ſit, tractu temporis aeri expoſitum pravam & quaſi malignam induat naturam, ſumptumque intra corpus cordis anguſtias, cardialgias, lipothymias, vomituſque, & ſimilia prava ſymptomata procreet, quæ facilè tamen evitabimus, ſi vel ſingulis diebus vel tribus menſibus recenter illud conficiamus, vel jam paratum antimonium diaphoreticum vetuſtum, additâ portiunculâ nitri, aut etiam abſque nitro, per unam vel alteram horam Vulcano tradamus, penituſque ighiamus, iterumque, ſi nitrum additum fuerit, edulcoremus, & parumper reverberemus.*

Purchas's 2d part, *lib.* vi. *cap.* 8. A vulgar experiment generally affirmed, as by *Alpinus in Med. Egypt. lib.* iv. *cap.* 8. who long lived here upon the teſtimony of *Paulus Moucilus*, the French conſul, *Baptiſtæ Elianus* a Jeſuit, and *John Varot* an Engliſhman.

To prove, that it proceedeth from a natural cauſe, this one, though ſtrange, yet true experiment, will ſuffice. Take of the earth of *Egypt*, adjoining to the river, and preſerve it carefully, that it neither come to be wet nor waſted; weigh it daily, and you ſhall find it neither more nor leſs heavy until the 17th of *June*, at which day it beginneth to grow more ponderous, and augmenteth with the augmentation of the river, whereby they have an infallible knowledge of the ſtate of the deluge, proceeding, without doubt, from the humidity of the air, which having a recourſe through all paſſible places, and mixing therewith, increaſeth the ſame as it increaſeth in moiſture.

A LEARNED phyſician of the college of *London* confeſſed to me, that he found by his own obſervation, that antimonium diaphoreticum, being kept ſome years, though in a covered veſſel, acquired a vomitive quality, which it had not before; and that having long kept in a ſtopped glaſs a parcel of his own ceruſs of antimony, of which he uſed to give 12, 15, or more grains, without finding it emetick; he found, that in proceſs of time it was ſo degenerated, that when he gave four or five grains, it would cauſe vomits.

EARTH laid up together in the air, for four, five or ſix years, does make far better pots for cloſeneſs, and holding of the fire, than that, which has lain but one ſeaſon above ground, though that itſelf be much better than that, which is newly dug up, which will be very apt to crack in the fire, or when it comes to wet; as alſo thoſe bricks, that lye at the top of the furnace, and therefore are not ſo thick covered as they burn, and are apt to deceive builders, when they come to be expoſed to the rain and weather.

TITLE XXXIX.

Of the air in reference to the propagation and vegetation of plants.

AN ingenious traveller, that frequented the Pyrenean mountains, eſpecially that, which many count the higheſt of them, and is known by the name of *Pic de Midi*, affirmed to me, that he, as well as ſeveral others, had manifeſtly obſerved a ſcarce credible difference between that ſide of thoſe mountains, that regards *France*, and that, which reaches to *Spain*; for at the ſame time the former was verdant and flouriſhing, and yielded a delightful proſpect to the traveller, as well as plentiful proviſions to the inhabitants; the Spaniſh ſide of the hills was parched, and ruſſet, and barren, and looked diſmally, like a wilderneſs: which great difference of countries, obſervable in the ſame hills at the ſame time of the year, he imputed to the fierce parching, and ſometimes blaſting winds beat upon the Spaniſh ſide, and made that look ſo ſqualid, whilſt the hills, that ſuffered this miſchief on one ſide, did by their height check theſe hurtful winds, and ſkreening from them the French ſide of the mountains, left them to enjoy advantages, that the ſoil and climate furniſhed them with.

TITLE XL.

Of the air in reference to the generation, life, and health, of animals.

DE vitâ igitur ac morte, & iis pene omnibus, quæ huic conſiderationi affinia ſunt, dictum eſt. De ſanitate verò morboque non ſolum medici, ſed & phyſici eſt, cauſas quadantenus referre. Quatenus verò hi differant, & quatenus diverſa contemplantur, ignorare non convenit. Equidem quòd confinis ſit quadantenus hæc medici phyſicique tractatio, & res ipſa teſtatur. Nam & medici, quicunque paulò elegantiores & diligentiores ſunt, de natura dicunt, & artis ſua principia inde ſumere dignantur; & phyſici omnes fere, qui concinnitatis aliquid habent, tractationem naturæ uſque ad medicinam perſequuntur. *Ariſtot. de Reſpirat. cap.* 21. & *parag.* 87.

AUGUST 13. The temperature of the air, both as to ſalubrity and other regards, may be derived as well from the ſubterraneal ſteams, as the ſuperficial effluviums of the earth, and both theſe ſorts of ſteams being variouſly tranſported and ſhuffled, and compounded by the winds and other motions of the air, upon the mixtures of them, the local qualities of the air, in differing places, may be ſuppoſed to reſult.

ABOUT three months before the late great plague began in *London* (in the year 1665) there came to Dr. *M.* a patient of his, to deſire his advice for her huſband; and the doctor having inquired what ailed him, ſhe anſwered,

ſwered, that his chief diſtemper was a ſwelling in his groin, and upon that occaſion added, that her huſband aſſured her of his being confident, that the next ſummer the plague would be very rife in *London*: for which prediction he gave this reaſon, that in the laſt great plague he fell ſick of that diſeaſe, and he then had a peſtilential tumour; ſo in two other plagues, that ſince happened, though much inferior to that great one, each of them had a riſing in his body to be its forerunner; and now having a great tumour in the forementioned place, he doubted not but it would be followed by a raging peſtilence, which accordingly enſued. Having heard much talk of ſomething of this nature, as related by the doctor, I enquired of him how much of it was true, and received for anſwer the foregoing narrative.

You did not perhaps expect, that the mere local motion of the air ſhould be mentioned by me among the cauſes of the effects of its changes: and indeed the phænomena I have yet met with reducible to this kind have been but very few, notwithſtanding which I ſhall take notice, that this local motion may in certain caſes operate on other bodies, either as it turns the air into a wind, or as the tremulous motion of the air is modified into ſound, or as the air is put into a vehement and diſorderly motion by thunder.

As to the firſt of theſe it is evident, that upon the vehemence or ſlackneſs, and the places whence and where the changing wind happens to blow, there may divers effects enſue, eſpecially in animated bodies. And this not only as the wind is accompanied with cold and heat, or moiſture, or drineſs, but (to reſtrain ourſelves to inſtances more cloſely pertinent to our preſent purpoſe) as the wind is flowing air, or an aereal ſtream, for only as ſuch it may ventilate the places, through which it paſſes, and by expelling the ſtagnant air, and introducing other air, may contribute to many of thoſe changes (eſpecially as to the health of animals) that we ſee to depend upon the alteration of air, and perhaps among the more tender ſort of animals, there may be found ſome, in which the motion of the external air, though excluded by walls and windows, may have a conſiderable and immediate operation: for I have learned by enquiry from ſome curious natives of *Languedoc* (where I had the curioſity to look after ſilk-worms, abounding in that province) that in caſe it happened, when the worms having eaten their fill began to diſpoſe themſelves to work their ſilken eggs; in caſe, I ſay, it then happened to be thundering weather, a great part of the worms, eſpecially the leſs vigorous, would be deſtroyed.

He affirmed to me, that in ſome mines of above a thouſand foot deep, he ſaw horſes, that had been let down by ropes to the third part of the depth, that is above a hundred yards; and that ſeveral of them died either in the letting down, or by the change of the air; yet ſeveral of them ſurvived, and were employed about the engines belonging to the mines, and ſeemed not to have any ſenſible inconvenience as to reſpiration, though in the receptacles they wrought in, they were furniſhed with air but from the groove, through which they were let down, and by a moderately big ſhaft.

An ingenious traveller, that has had the curioſity to viſit the mines of ſeveral countries, as *Bohemia*, *Saxony*, *Swedeland*, *&c.* anſwered me, that the deepeſt mine he ſaw in *Bohemia* was of about 2000 of our feet.

An intelligent perſon, that was for many years conſul of the Engliſh nation at *Tripoli* in *Barbary*; and at another time governor of the caſtle (called) of the Coaſt, belonging to the Engliſh African company in *Guinea*, being diſcourſed with by me, about the diſeaſes incident to that very unhealthy place, and about the worms, that bred in men's legs, told me, that the great noxiouſneſs of the air was not conſtant, but frequently ceaſed, and returned within no long compaſs of time; inſomuch that all his men would continue in health for many days together, and then on a ſudden divers of them would fall ſick, eſpecially of fevers and fluxes, that uſually killed them in forty eight hours or leſs.

Dr. *C.* chief phyſician to the Ruſſian emperor, confirmed to me, that being in *Ruſſia* in the winter, when the froſt was very hard, and the eaſt or north-eaſt wind blew cold, if he turned his face toward the wind, and walked againſt it, (which at other times he was wont, and took a delight to do) he found himſelf unable to fetch his breath, and almoſt ſtifled, as if the air were very thick, or rather a great ſtiffneſs brought upon the organs of reſpiration, whereby he was unable to move them as at other times, ſo that he was fain to turn his head from the wind, that he might be able to fetch his breath.

An obſerving perſon being aſked about a tradition of ſeamen, that the lice of Europeans die when the ſhips paſs the line; anſwered me, that he did not find it to be true, as it is wont to be delivered; but this he plainly obſerved in ſeveral of our Engliſh, with whom he ſailed, that all the lice quitted their bodies, and got up into their heads, whence they diſperſed themſelves again, when the ſhip had left the equator a pretty way behind it.

But I remember, that another acquaintance of mine, that divers times paſſed the equinoctial in Portugal ſhips, which uſed to go to the *Indies* well crowded with people, many of them more poor than cleanly, anſwered me, that he had heedfully obſerved thoſe people's numerous lice to die away as they croſs the line, though in no long time after the ſame ſort of cattle would begin to moleſt them again.

His royal highneſs the duke of *York*, at his return out of *Scotland*, having been pleaſed to diſcourſe with ſome of us, that had the honour to be then near him, of ſome obſervations he made in his journey, mentioned among other things, that agues were very unfrequent in *Scotland*, which yet that year were very rife over almoſt all *England*. This gave

me

me afterwards the curiosity to inquire of a studious person, who is one of the chief of the Scotish nobility, what he knew about the unfrequency of agues in his country. To which his lordship replied, that as to quartan agues it was generally taken notice of, insomuch that when news was brought, that a gentleman, whom he named, fell sick of that disease, amongst them in the country it was looked upon as a strange and remarkable thing. And though divers persons bring quartans out of *England* to *Edinburgh*, yet they so seldom keep them long there, that a Scotish physician, whom he named to me, offered to lay five to one of the quick recovery of several patients of his, if they would make some reasonable stay in that city.

Roderici Fons. de Sanit. tuend. pag. 105, 106.

Aer autem corrigetur causa corruptionis ablata, & quod jam inductum est mali extinguendo: si igitur ex nimio humore aer putrescit, ignibus accensis, qui omni putredini remedio sunt, exsiccandus, sic ignes, per vias & domus fiant ex odoratis plantis, qualis Laurus est, Myrtus, Pinus, Cupressus, Rosmarinus, & reliquæ ejus generis, qua ratione pestem Athenis Hippocrates extinxit; vapores præterea maligni per aeram sparsi dissipandi sunt, id quod à magnis ventis fieri solet. Sic Olyssiponi, cum trium dierum ingens procella venisset, pestis extincta nuper, est & in Maroco ingens pestilentia vento quodam evanuit; qui veluti è fornace (adeo calidus erat) exire videbatur, aerem autem nos imitando ventos commovere poterimus; si bombardarum strepitus multos fieri curemus; si verò vapores ex paludibus ac stagnantibus aquis fieri videntur, eas resiccare aut novare oportet frequenter, maximè per æstatem. Renovantur autem novis supervenientibus aquis, quas è fluminibus per canales traducere oportet; aut siccandæ sunt factis rivulis & fossis, per quæ superfluant ad flumina; quod cum primus magnus Etruriæ dux Cosmus Pisis fecisset, & magna animi contentione nunc faciat Ferdinandus, factum est, ut saluberrimus ejus urbis aer per omne anni tempus sit redditus: verum si cadaverum inhumatorum multitudo aerem inficit, magna & profunda facta fovea sepeliantur; si ab immunditie, & excrementis, quæ per urbem & domos sparguntur, id quod, ut reor, Bizantii, & Olyssiponi, in causa est, cur pestis adeo sæviat, ac duret, mundare oportet omnia; viæ ac domus quotidiè, vel saltem semel in septimanâ, repurgandæ.

1. Joh. Beguinus in Tyrocin. Chymic. Lib. II. cap. 13. *Dignum admiratione est, quod quamvis in viciniâ Hydriæ comitatûs Goricienſis, ubi reperitur copiosè mercurius, singulis ferè annis lues pestifera grassatur, illa tamen semper immunis ab hac manere soleat; idque viri provectæ ætatis se observasse, & à majoribus suis accepisse, mihi sanctè confirmarunt. Hinc patet, mercurium esse summum omnis putredinis ac corruptionis alexipharmacum.* 2. Michael Majerus in lusu de mercurio. *Argentum vivum est plurimorum morborum alexipharmacum, &, ut testantur quidam, ipsius pestis (cum eo loco, ubi mercurius effoditur, & tractatur, nunquam aut rarissimè hoc contagium grassetur) dummodò maneat in suâ propriâ naturâ, & non à salibus aut aquis corrosivis inficiatur, ac venenosus reddatur.*

A very ingenious physician, that travelled much in the *East-Indies*, and visited some islands in the *South Sea*, to which our English were not permitted to have access, being asked of me some questions about the effects and changes of the air in those parts, related to me, that having made some stay in the famed island of *Ternate*, he learned, that the Dutch (who had mastered the inhabitants) did, upon a composition made with the king for his damages, cut down almost all the numerous clove-trees, that grew in that island, that thereby they might keep up the high rate of that spice, as indeed they have done. Whereupon there happened a change in the temperature of the air, that gave cause to conclude, that the exhalations of the blossoms which (being dried) afford the cloves, were not only very pleasant, but very healthful too: for no long time after the excision of these fragrant trees, the island became very unhealthful, which this physician very probably imputed to the corrosive and noxious steams, which plentifully issuing out from a kind of vulcan, or smoking, and sometimes burning hill, depraves the air of that island that is but little, but had their hurtful effects formerly prevented by the aromatick and benign emanations of those numerous blossoms and trees, that richly impregnated the air, and by their volatile and oily salts, opposed and hindred the effects of the sulphureous and other sharp steams of the vulcan. And my relator assures me, that this change of the air's constitution was so remarkable and acknowledged, when he was there, that whereas formerly sick and valetudinary persons used to be sent thither from *Batavia* to recover their health by the goodness of the air (as we often send consumptive persons into *France*) the air at his being in *Ternate* had been for divers years so unhealthful, that the Dutch were fain (from *Batavia*, or other more healthy places) to send men twice a year to relieve the garrisons, and bring back the many sick they usually found at their arrival in that formerly healthy island.

An observing physician lately returned from *Tangier*, answered me, that though otherwise it be a healthy place, he took notice, that it was not unusual for new comers to find themselves feverish for many weeks, or some months after their arrival, especially if the piercing easterly wind happened to reign. This, he says, he found in himself, not only by a constant heat and some other symptoms, but by that main one of the preternatural quickness of his pulse. He added, that this disease, though very mild, held him near four months; when the easterly winds happened to blow, on which his feverishness so depended, that he could easily, when he awaked in the morning, know without asking, whether that wind blew or not.

May 16. We put into a small receiver five or six litle ants, which ran about very briskly; but the air being pumped out, they presently lost their motion, which they soon recovered upon the restoring of the air to them.

them. Then the air was again withdrawn, and the inſects thereby brought to lye (ſome upon their backs) as ſtark dead: in which condition they were ſuffered to remain about five or ſix hours; after which the air being let in upon them, they nevertheleſs continued ſeemingly dead for many minutes, (as we gueſſed between 15 and 30) but at length all recovered, running nimbly up and down the glaſs, though it were late at night.

Relatione della Provincia di Malavar. pag. 64 & 65.

Si patrono queſte barche dalla coſta della peſcaria, è vanno all iſola di Ceilam, nella coſta della quale per la lunghezza di venti miglia, tre ſole miglia lontane da terra, ſette braccia abbaſſo arrivando ſino alli dieci nel fondo, ſi ritrova infinita quanta di madreperle, eſcono per queſta peſca la barche la matina col vento di terra, & arrivando al poſto delle madreperle, gettare l'ancore, è fermareſi in quel poſto, cominciano à tuffarſi nel mare i marinari, de quali ogni barca ne ha quindeci, è venti, è ciaſcuno di eſſi ſi lega nel mezzo, con una ſune, della quale ha cura uno, che reſta in barca è con un'altra ſune legandoſi una pietra alla gamba, un'altro ha pure cura di quella, e cingendoſi un' ſacco di cuoio dinanzi, mettendoſi le guante alle mani, coſi legato ſi tufta con violenza nel mare, lentando quelli le funi, è col peſo della pietra, va con grandiſs' violenza giu, & arrivato ch' e ſcioliaſi dalla gamba quella ſune, con la quale ſta legata la pietra, reſta egli libero, & la pietra viene ſubito tirata ſoprada quello, che n'ha cura, et il marinaro poi comincia con molta ſollecitudine à pigliare quelle madreperle, che li vengono dinanzi, e le mette nel ſacco, e ſentendoſi mancare la reſpiratione, tocca la ſune, con la quale ſta legato nel mezzo, e quello ſubito con grandiſs' velocita lo tira et arrivando nella barca, ſcaricando le madre perle ripiglia fiato, è dopo torna a legarſi di nuovo la pietra, e di nuovo ſi tufta come ſopra's e detto, e ſempre coſi per tutta la giornata. Et e tanto faticoſa queſta peſca, ch'eſſendo, tanto profunde le madre perle nel mare, molti mancando loro la reſpiratione ſi trovano affogati.

It is, by long obſervation and often repeated experience, found certain, that if any foreigner lye on ſhore all night at *Johanna*, they ſeldom miſs to be taken with ſickneſs there, or within a few days after their departure from the iſland, and are commonly ſeized with putrid fevers, whereof moſt die in two or three days, though thoſe, that have remained upon the place all day long, for ſeveral days together, are almoſt always ſafe, if they go on board of ſhip every night about a mile, or a little further from the ſhore. The iſland abounds with the greateſt variety of plants and trees, that can be almoſt imagined in that circumference, and is generally exceſſive hot in the day time, but cold after ſun-ſet. Whence it may poſſibly be ſuppoſed, that the moſt volatile parts of thoſe promiſcuous (and probably many of them poiſonous) plants, exalted in the day time by degrees, and ſuddenly condenſed at night, may by inſpiration infect the maſs of blood much after the ſame manner as in peſtilential airs. The inhabitants themſelves are very much ſubject to fevers, (of what ſort I could not learn) for which they cut or ſcarify their breaſt or abdomen in ſeveral places: but they obſerve, that few live, except their fever terminates in a conſiderable number of botches in divers parts of the body. There is one hill there remarkable for height, which is ſeldom or never free from thick fogs or clouds hovering over the top of it; ſometimes higher, ſometimes lower, according as the weather alters.

Upon the coaſt of *Cormandell*, and moſt maritime places of the *Eaſt Indies*, there are ſometimes (I think yearly) fogs ſo thick (notwithſtanding it is then very hot) that all, or moſt inhabitants from other nations, and the tenderer ſort of the natives, are neceſſitated to keep their houſes, with the doors and windows faſt ſhut, there being little or no commerce at that time.

At *Bâlaſſore* in the bay of *Bengale*, and in divers other parts in that country, there happens after great rains, ſo great corruption of the air, that the ſtinking ſmell is very nauſeous to the inhabitants; which I preſume may be chiefly occaſioned by a great number of frogs, and other reptiles (wherewith thoſe places abound) left upon the dry places after the inundation, and then putrified by the exceſſive heat of the ſun. At this time there is great ſickneſs and mortality amongſt the natives, chiefly by violent fevers.

In the return of Engliſh ſhips from the *Eaſt Indies*, they generally put their ſick people on ſhore at St. *Helena*, where they find ſo ſenſible alteration, that although carried thither, there are few, that do not recover ſo much ſtrength, as to walk about in two or three days, which, in all probability, muſt chiefly be attributed to the alteration of air, not of food, there being in moſt ſhips much the ſame benefit of freſh proviſion for thoſe, that are diſeaſed.

Le chemin plus court de Moſul a Bagdad eſt par la Meſopotamie; mais on n'y trouve aucun village, & le Samiel y regne toute l'eté depuis Moſul juſques à Sourat; ce qui oblige à prendre l'eau ſur le Tigre, où ce vent ne ſouffle point. Le nom de ce vent eſt compoſé des mots, ſam et jel, c'eſt à dire poiſon et vent, comme qui diroit vent de poiſon. Ce pourroit être le vent urens, dont parle Job xxvii. 21. *Lorſque quelqu'un à reſpiré ce vent, il tombe mort ſubitement, quoi qu'il en ait quelques uns, qui ont le temps de dire, qu'ils brûlent au dedans. D'abord qu'on eſt mort, on devient tout noir, et ſi on tire le mort par le bras, où par la jambe, où par un autre endroit, la chair quitte les os, et reſte entre les mains de ceux, qui la touchent.* Thevenot dans le bibliotheque univerſel: Tom. XIII. *p.* 266.

Doctor *Collins* relates, that in *Muſcovy* their horſes are much ſubject to a very ſcurvy diſeaſe, whoſe Ruſſian name I have forgot, from which the natives are wont to preſerve them, by keeping goats in their ſtables: and being aſked by me, whether he had this by tradition, or upon his own trial? he affirmed, that

that he had found it true himself, and that he therefore was wont to keep goats in his own stable.

The ingenious Mr. *Rycaut*, English consul at *Smyrna*, being asked of me, whether at *Smyrna* as well as at *Aleppo*, he observed, that the plague, that uses to rage in the former part of the summer, degenerates into other diseases about the latter end of *June*, and beginning of *July*; he answered me, that at *Smyrna* the observation does not hold so much as at *Aleppo*; but yet at *Smyrna* they generally observe, that about that time of the year, though exceeding hot, the malignity of the plague does notably lessen, for it is not quite so infectious, nor near so generally mortal, as it was in the former part of the summer. When many years ago I heard of this strange phænomenon of the pestilence at *Aleppo*, I began to think, whether a possible, though not perhaps the true cause of it may not be such as this; that the pestilential corpuscles, that rove up and down in the air, during the former part of the summer, require such a bulk or grossness to enable them to exercise their pernicious operations; but when the weather grows to be exceeding hot, that heat of the air becomes able to dissipate those corpuscles, and deprive them of that bulk, that we have supposed necessary to their destructive efficacy. For illustration of this conjecture, we may take notice of the smoke, that issues out of the weik of a candle newly blown out; for whilst the sooty corpuscles retain their bigness and texture, they are able to offend the nostrils very much by their stink, and sometimes to cause convulsive motions and abortions in teeming women: but if you apply a flame to this smoke, it presently discusses this fuliginous matter, and dissipates it into particles of quite another nature, which by this means are deprived of all their offensive smell, and some other ill qualities. It may also be said, that the great increase of heat in *July* may enable the sun-beams, by penetrating the earth deeper, and agitating its lower parts stronger, and producing crevisses, and other new or formerly obstructed passages in the upper parts of it, may elevate into the air divers saline and other new corpuscles, which may either divide or dissipate the pestilential ones, or else by associating themselves with them, make up new concretions, differing from the pestilential corpuscles, in bulk, shape, texture or motion, in most or all of these, by which means the morbifick corpuscles being much altered, their operations on the human bodies they invade, may be so too, and the diseases they produce may become less malignant, or degenerate into some other disease. And if it be demanded, why this does not happen elsewhere as well as at *Aleppo* and *Smyrna*? it may be answered, that the concourse of causes may not be the same, and particularly, that the soil of those two places may be peculiarly disposed to emit pestilential corpuscles of such a determinate nature, with such a degree of heat, and dissipable by a greater, or with a more intense heat, to afford also exhalations capable to correct the former, as it is delivered by good authors, and ingenious men have confirmed it upon their own observation, that yearly, at grand *Cairo*, in the heat of summer the plague ceases to be mortal, and almost to be infectious, when the *Nile* begins to overflow; which wonderful change I should not so much ascribe to a frigeration of the air, that usually accompanies the swellings of the waters, (since pestilences rage in much cooler weather, than can be supposed in so hot a climate as that of *Egypt* in *July*) as to some nitrous and other corrected exhalations, that are plentifully emitted by the freshly arriving waters.

There is an account, that has not, that I know of, been taken notice of, upon which the supervening coldness and heat of the air may *pro tempore* very much alter the qualities of it, in reference to the bodies and health of men: for the air being a fluid body as well as water, and impregnated with salts of different kinds, some merely saline, and others associated with sulphureous and other kinds of particles; it seems not improbable, that what happens in that grosser fluid water, impregnated with differing sorts of salts, and altered by succession of heat and cold, takes place also in the air. I purposely tried in water, that by dissolving in it convenient quantities of two differing salts, though whilst the liquor was hot, or perhaps so much as lukewarm, they would swim together undistinguishably in the liquor, and so were in a capacity to act jointly, and, as the schools speak, *actione communi*, on divers occasions; yet when the liquor was cold, and sometimes when there was only a considerable remission of the heat, the saline particles of one kind, being not capable of being any longer sufficiently agitated by so faint a degree of heat, would convene into grains or crystals; and losing their fluidity and motion, visibly separate themselves from the other kind of salts, which yet continued fluid in the water, where it could now act but by its own particular qualities, and not as formerly, *actione communi*.

The clearest instance I found of this observation, was afforded me by an experiment made with the solutions of alum and nitre; a relation of which I find among my adversaria, in the following terms.

Equal parts of alum and nitre being dissolved in the same portion of fair water; and the liquor being in good measure evaporated, the earthen vessel, that contained it, was set in the cold, by which means, at the bottom and the lower part of the sides, the alum appeared to be first coagulated in many octaedrical grains, no crystals of nitre yet being visible. Afterwards, upon a further evaporation of the water, and the removal of the vessel from the fire, there appeared more grains of alum, but as yet no nitre: wherefore having yet further evaporated the liquor, at length the nitre shot plentifully into fine little crystals of the shape proper to that salt.

THIS is the account my note-book contains of this trial, which seems to invite us to conjecture, that of the numerous sorts of saline corpuscles, that rove up and down in the air, whilst it is well heated by the sun, or other causes, some sorts may by the absence of that heat, or some supervening causes of coldness, be made to separate from the others, which were thereby contemperated, or perhaps enabled to co-operate to divers purposes, that they were not fit for alone; and to form concretions, which, though not singly visible, may be too great to be kept in a state of fluidity by the diminished heat of the air.

A MOUSE lived ten minutes at least with a quarter air, and three afterwards.

TITLE XLI.

Of heavy bodies sustained in or taken up into the air.

TITLE XLII.

Of dew.

TITLE XLIII.

Of rain.

AN eminent virtuoso informed me, that in the country of *Campen*, he had seen divers pits, that are digged for turf, or rather peat, which were not deep for the most part, but reached to a kind of quick-sand, upon which the rain falling did by degrees, in some years, form a kind of slimy earth or clay, which was much of a martial nature; and being skilfully handled, would yield good iron.

THE same person assured me, that he had divers times distilled the water of *Campen* in new and fine glasses, and still found them to leave a considerable quantity of stony matter at the bottom, notwithstanding the rectification.

L. I. c. 8. De Mont. Bohemiæ, p. 26. *A Milessow monte temporum præsagia capiuntur.*

Quicquid erit, sine fuco significat, velut Rotenberg, Silesiæ compastum appellant, perinde Milessow temporum prognostes jure merito dici posset. Vidi ex proximo totum aliquando montem densissimis nebulis contectum, eâ prorsus imagine, qua mons Sinai Moyse in nebula latente depingitur, at cæteri circum montes innubes & hilares, velut rerum gerendarum ignari, stabant, sol ipse formosissimus ibat; at accolæ locorum domum fugiebant, pecora urgebant, meque, ut domum protinus reciperem, properarem, & equos currum trahentes concitari juberem, monebant, neque horæ quadrans interceſſit, jam cœlum obduci, sol contegi, eripi omnis aspectus.

VIRG. *Immensum cœlo ruit agmen aquarum;*
——ruit arduus æther,
Et pluvia ingenti sata læta, boúmque labores.
Diluit, implentur fossæ,

& quæ divinus poeta prosequitur. At contrà etiam accidere vidi, ut cæteri fumârint montes, Milessow nihil se commovente, nihil aut nubilum aut turbidum minante; incolæ rogati, nihil esse magnopere timendum à cæteris spondebant, hunc unum intuendum esse, horum nubila omnia à Milessow quodammodo devorari.

TITLE XLIV.

Of hail.

ON ecrit de l'isle en Flandres le 25 May, style nouveau, qu'il tomba dans cette ville la une graisle, dont les moindres grains estoient comme des oeufs de pigeon. Cet orage a passé sur la citadelle & la ville, & n'a pas laissé une vitre entiere du coste du vent: les maisons sont toutes decouvertes, & les arbres rompus, les bleds coupez, & les perdrix & les lievres morts. On a pesé plusieurs grains de cette graisle, dont les uns estoient d'un quarteron, de demi livre, de trois quarterons, et les plus gros d'une livre & davantage. Il y en avoit un entr' autres, qui avoit dans le milieu une espece de matiere brune, qu'on mit dans le feu, qui fit faire un grand bruit. Il y en avoit un, qui estoit diaphane, lequel estant mis aupres du feu, fondit tout aussi tost comme du plomb, quoy qu'il fut beaucoup plus dur que les autres.

TITLE XLV.

Of snow.

TITLE XLVI.

Of other things falling out of the air.

EO ipso anno, quo dux Eboracensis postremo rediit è Scotia Londinum, depluere tanta copia pisciculi halecibus colore, figurâ, sapore quam simillimi, in superiore Gallocidiæ in Scotia parte non procul à mari, ut duo terræ jugera ad Robertum Murray de Brughton equitem pertinentia nunc Londini, ut audio, degentem, cooperuerint. Rem autem totam serenissimo duci Eboracensi prius de eadem ab eo interrogatus, quod tum certior ab aliis de hâc pluvia factus esset, tanquam testis oculatus, ut qui aliquos horum pisciculorum videram, confirmavi: is porro ingeniosissime, summâque veri specie nodum ita solvit, ut diceret hos

pisciculos

piſciculos unà cum aquis furentium ventorum gyro in turbinem actis evectos eſſe nubes, è quibus non procul inde pondere rurſus ſuo relapſi fuerint in vicinam terram.

TITLE XLVII.

Promiſcuous experiments and obſervations of the air.

TITLE XLVIII.

Deſiderata in the hiſtory of the air, and propoſals towards ſupplying them.

GENERAL HEADS FOR THE NATURAL HISTORY OF A COUNTRY, Great or Small;

Drawn out for the Uſe of TRAVELLERS and NAVIGATORS.

Printed firſt in the *Philoſophical Tranſactions*, N°. XI. p. 186. N°. XVIII. p. 315. and N°. XIX. p. 330. and afterwards reprinted with *other Directions for Navigators by another Hand*, at *London* 1692, in 12mo.

THE things to be obſerved in ſuch a hiſtory, may be variouſly (and almoſt at pleaſure) divided: as, into ſupraterraneous, terreſtrial, and ſubterraneous, and otherwiſe; but we will at preſent diſtinguiſh them into thoſe things, that reſpect the heavens, or concern the air, the water, or the earth.

1. To the firſt ſort of particulars belong the longitude and latitude of the place (that being of moment in reference to the obſervations about the air, *&c.*) and, conſequently, the length of the longeſt and ſhorteſt days and nights, the climate, parallels, *&c.* what fixed ſtars are, and what not ſeen there; what conſtellations it is ſaid to be ſubject to: whereunto may be added other aſtrological matters, if they be thought worth mentioning.

2. ABOUT the air may be obſerved its temperature, as to the firſt four qualities (commonly ſo called) and the meaſures of them; its weight, clearneſs, refractive power; its ſubtlety or groſſneſs; its abounding with, or wanting an eſurine ſalt; its variations according to the ſeaſons of the year, and the times of the day; what duration the ſeveral kinds of weather uſually have; what meteors it is moſt or leaſt wont to breed; and in what order they are generated; and how long they uſually laſt: eſpecially, what winds it is ſubject to; whether any of them be ſtated and ordinary, *&c.* what diſeaſes are epidemical, that are ſuppoſed to flow from the air: what other diſeaſes, wherein that hath a ſhare, the country is ſubject to; the plague, and contagious ſickneſſes: what is the uſual ſalubrity or inſalubrity of the air; and with what conſtitutions it agrees better or worſe than others.

3. ABOUT the water may be obſerved the ſea, its depth, degree of ſaltneſs, tides, currents, *&c.* Next, rivers, their bigneſs, length, courſe, inundations, goodneſs, levity (or their contraries) of waters, *&c.* Then, lakes, ponds, ſprings, and eſpecially mineral waters, their

kinds, qualities, virtues, and how examined. To the waters belong alſo fiſhes, what kinds of them (whether ſalt or freſh-water fiſh) are to be found in the country; their ſtore, bigneſs, goodneſs, ſeaſons, haunts, peculiarities of any kind, and the ways of taking them, eſpecially thoſe that are not purely mechanical.

4. In the earth may be obſerved,

1. Itſelf.

2. Its inhabitants, and its productions, and theſe external, and internal.

Firſt, in the earth itſelf may be obſerved its dimenſions, ſituation, eaſt, weſt, north and ſouth; its figure, its plains and valleys, and their extent; its hills and mountains, and the height of the talleſt, both in reference to the neighbouring valleys or plains, and in reference to the level of the ſea: as alſo, whether the mountains lye ſcattered, or in ridges; and whether thoſe run north and ſouth, or eaſt and weſt, *&c.* what promontories, fiery or ſmoking hills, *&c.* the country hath, or hath not; whether the country be coherent, or much broken into iſlands: what the magnetical declination is in ſeveral places, and the variations of that declination in the ſame place (and, if either of thoſe be very conſiderable, then, what circumſtances may aſſiſt one to gueſs at the reaſon, as ſubterraneal fires, the vicinity of iron mines, *&c.*) what the nature of the ſoil is, whether clay, ſandy, *&c.* or good mould; and what grains, fruits, and other vegetables, do the moſt naturally agree with it: as alſo, by what particular arts and induſtries the inhabitants improve the advantages, and remedy the inconveniencies of their ſoil: what hidden qualities the ſoil may have (as that of *Ireland*, againſt venomous beaſts, *&c.*)

Secondly, above the ignobler productions of the earth, there muſt be a careful account given of the inhabitants themſelves, both natives and ſtrangers, that have been long ſettled there: and in particular, their ſtature, ſhape, colour, features, ſtrength, agility, beauty (or the want of it) complexions, hair, diet, inclinations, and cuſtoms that ſeem not due to education. As to their women (beſides the other things) may be obſerved their fruitfulneſs or barrenneſs, their hard or eaſy labour, *&c.* and both in women and men muſt be taken notice of what diſeaſes they are ſubject to, and in theſe whether there be any ſymptom, or any other circumſtance, that is unuſual and remarkable.

As to the external productions of the earth, the enquiries may be ſuch as theſe: what graſſes, grains, herbs (garden and wild) flowers, fruit-trees, timber-trees, (eſpecially any trees, whoſe wood is conſiderable) coppices, groves, woods, foreſts, *&c.* the country has or wants: what peculiarities are obſervable in any of them: what ſoils they moſt like or diſlike, and with what culture they thrive beſt. What animals the country has or wants, both as to wild beaſts, hawks, and other birds of prey; and as to poultry, and cattle of all ſorts; and particularly, whether it have any animals that are not common, or any thing that is peculiar in thoſe that are ſo.

The internal productions or concealments of the earth are here underſtood to be the riches, that lye hid under the ground, and are not already referred to other enquiries.

Among theſe ſubterraneal obſervations may be taken notice of, what ſorts of minerals of any kind they want, as well as what they have; then, what quarries the country affords, and the particular conditions both of the quarries and the ſtones; as alſo, how the beds of ſtone lye, in reference to north and ſouth, *&c.* what clays and earths it affords, as tobacco-pipe-clay, marls, fullers-earths, earths for potters wares, bolus's, and other medicated earths: what other minerals it yields, as coals, ſalt-mines, or ſalt-ſprings, alum, vitriol, ſulphur, *&c.* what metals the country yields, and a deſcription of the mines, their number, ſituation, depth, ſigns, waters, damps, quantities of ore, goodneſs of ore, extraneous things, and ways of reducing their ores into metals, *&c.*

To theſe general articles of enquiries (ſaith their propoſer) ſhould be added, 1. Enquiries about traditions concerning all particular things relating to that country, as either peculiar to it, or at leaſt uncommon elſewhere. 2. Enquiries, that require learning or ſkill in the anſwerer: to which ſhould be ſubjoined propoſals of ways, to enable men to give anſwers to theſe more difficult enquiries.

What is the proportion of ſalt, that is in the water of differing ſeas? and whether in the ſame ſea it be always the ſame? and if it be not, how much it differs?

What is the gravity of ſea-waters in reference to freſh waters, and to one another; whether it vary not in ſummer and winter, and on other ſcores? and whether in the ſame ſeaſon its gravity proceed only from the greater or leſſer proportion of ſalt that is in it, and not ſometimes from other cauſes? and what are the differing gravities of the ſea-water, according to the climates *.

What are the odors, colours and taſtes, obſervable in ſea-water?

What is the depth of the ſea in ſeveral places, and the order of its increaſe and decrements? and whether the bottom of the ſea does always riſe towards the ſhore, unleſs accidentally interrupted?

Of the bottom of the ſea, and how it differs from the ſurface of the earth, in reference to the ſoil, and evenneſs or roughneſs of the ſuperficies; and the ſtones, minerals and vegetables to be found there?

* This laſt clauſe containing a difficult query, and that may ſeem ſomething odd, Mr. *Boyle* thinks fit to note, that having recommended this matter, among others, to a learned phyſician, that was ſailing into *America*, and furniſhed him with a ſmall hydroſtatical inſtrument, to obſerve from time to time the differences of gravity he might meet with; this account was returned him, that he found by the glaſs, the ſea-water to increaſe in weight, the nearer he came to the line, till he arrived at a certain degree of latitude, as he remembers it was about the 30th, after which the water ſeemed to retain the ſame ſpecifick gravity, till he came to the *Barbadoes*, or *Jamaica*.

WHAT the figuration of the ſeas from north to ſouth, and from eaſt to weſt, and in the ſeveral hemiſpheres and climates?

WHAT communication there is of ſeas by ſtreights and ſubterraneal conveyances?

OF the motion of the ſea by winds, and how far ſtorms reach downwards towards the bottom of the ſea?

OF the grand motions of the bulk or body of the ſea; eſpecially of the tides: their hiſtory as to their nature and differences.

The particulars whereof (ſaith the author) are here omitted; Sir *Robert Moray* and Dr. *Wallis* having by their more accurate inquiries about tides made them needleſs.

WHAT power the ſea hath to produce or haſten putrefaction in ſome bodies, and to preſerve others; as wood, cables, and others, that are ſunk under it?

OF the power aſcribed to the ſea to eject dead bodies, ſuccinum, ambergreaſe?

OF the ſhining of the ſea in the night?

WHAT are the medical virtues of the ſea, eſpecially againſt hydrophobia?

WHAT is its virtue to manure land? and what are the plants, that thrive beſt with ſea-water?

Articles of enquiries touching mines.

THE firſt, the neighbouring country about the mines.

THE ſecond, the ſoil where the mines are.

THE third, the ſigns of mines.

THE fourth, the ſtructure and other particulars belonging to the mines themſelves.

THE fifth, the nature and circumſtances of the ore.

THE ſixth, the reduction of the ore into metal.

Queries about the firſt title.

1. WHETHER the country be mountainous, plain, or diſtinguiſhed with vales? And in caſe it be mountainous, what kind of hills they are; whether high or low, or indifferently elevated? Whether almoſt equal, or very unequal in height? Whether fruitful or barren, cold or temperate, rocky or not; hollow or ſolid? Whether they run in ridges, or ſeem confuſedly placed; and, if the former, what way the ridges run, north or ſouth, *&c.* and whether they run any thing parallel to one another?

2. WHETHER the country be barren or fruitful? and, if any way fruitful, what it produces, and what it moſt abounds with?

3. WHAT cattle it nouriſhes, and whether they have any ſuch thing peculiar in point of bigneſs, colour, ſhape, longevity, fitneſs or unfitneſs to make good meat, *&c.* as may be rather aſcribed to the peculiar nature of the place, than to the barrenneſs of the ſoil, or other manifeſt cauſes?

4. WHETHER the natives, and other inhabitants, live longer or ſhorter than ordinary? Whether they live more or leſs healthy? Whether they be ſubject to any epidemical diſeaſes, that may very probably be imputed to the mines; and what theſe diſeaſes are, and what remedies are found ſucceſsful?

5. WHETHER the country be or be not furniſhed with rivers, brooks, ſprings, and other waters; and how theſe waters are conditioned?

6. WHETHER the air be dry or moiſt, hot or cold, clear or foggy, thick or thin, heavy or light; and eſpecially, whether the weather be more or leſs variable than ordinarily; or whether it be ſubject to great and ſudden changes, that may probably be imputed to the mineral and ſubterraneous ſteams; and what they are?

About the ſecond title.

7. WHETHER the ſoil, that is near the ſurface of the earth, be ſtony; and, if it be, what kind of ſtones it abounds with? Whether it be clayey, marley, chalky, *&c.?* And, if it be of ſeveral kinds, how many they are; and by what properties they are diſtinguiſhed?

About the third title.

8. BY what ſigns they know or gueſs, that there is a mine in ſuch a place?

9. THESE ſigns are either upon the ſurface of the earth, or beneath it.

To the former belong theſe queries.

10. Whether the ground be made barren by metalline or mineral effluviums?

11. WHETHER it be obſerved, that trees and other greater plants ſeem to have their tops burnt, or other leaves or outſides diſcoloured? or whether there be any plants, that do affect to grow over ſuch mines; and whether it have been tried, that other plants, that would proſper in the adjacent places, will not be made to grow or thrive?

12. WHETHER the ſtones and pebbles, that are waſhed by the brooks, ſprings, or other waters, have any coloured ſubſtance left upon them; and if they have, of what colour, weight, *&c.* theſe adherences are?

13. WHETHER the waters of the place propoſed do by their taſte, ſmell, ponderouſneſs, *&c.* diſcloſe themſelves to contain minerals? and, if they do, what minerals they or their reſidences, when they are evaporated away, do appear to abound with, or to participate of?

14. WHETHER ſnow will not lye, or froſt continue ſo long, or dew be generated or ſtay upon the ground in the place propoſed, as on other neighbouring grounds?

15. WHETHER the dew, that falls on that ground, will diſcolour white linen or woollen cloths, ſpread over night on the ſurface of the ground, and employed to collect the dew? And whether the rain, that falls there, and may be ſuppoſed to come thither from elſewhere, will diſcolour ſuch clothes, or afford any reſidence of a mineral nature?

16. WHETHER the place be more than ordinary ſubject to thunder and lightning, and to ſudden ſtorms or earthquakes, as likewiſe to nocturnal lights and fiery meteors.

17. WHETHER miſts uſe to riſe from grounds ſtored with minerals? What is obſervable in them, and what minerals they ſignify, and may be ſuppoſed to be produced by?

18. WHETHER the virgula divinatoria be uſed to find out the veins of propoſed mines; and, if it be, with what ſucceſs?

19. WHAT other ſigns above ground afford probability of mines, or direction for

following a vein over hills, vallies, lakes, rivers, *&c.?*

THE ſecond ſort of ſigns belonging to theſe queries are ſuch as follow.

20. WHETHER there be any clays, marles, or other mineral earths, yellow or liquid matters, that uſually give notice of the ore? and if there be more than one, how, and at what depths, they are wont to lye reſpectively? Of what thickneſs and conſiſtence they are; and in what order the diggers meet with them?

21. WHETHER there be any ſtones or marchaſites to be found near, or not very far from the ſurface of the ground, by which one may have ground to expect a mine? As is often obſerved in the tin mines of *Cornwall*, over which ſuch kind of ſtones are divers times found lying above ground.

22. WHETHER all ſtones of that kind do equally ſignify that mine? And, if not, how the ſignificant ſtones are to be known, as by colour, bigneſs, ſhape, weight, depth under ground, *&c.?*

23. WHETHER there be any earths of peculiar kinds, as to colour, conſiſtence, *&c.* that indicate a mine beneath or near them; and if there be, what they are, and what is their conſecution, if they have any?

24. WHETHER heat or damps give any aſſurance or a probability of finding a mine?

25. WHETHER water of any kind met with in digging, eſpecially at this or that depth, do betoken a mine?

26. WHETHER there be any ſigns of the nearneſs of the mine, and what they are?

27. WHETHER there be any ſigns of one's having miſſed the mine, either by being paſt above, or beneath, or having left it on either hand, and what they are?

28. WHETHER there may be any ſigns, not only of the diſtinct and determinate kind of metals or minerals, but of the plenty and goodneſs of the vein, and what they are?

29. WHETHER there be any ſigns of the depth of the vein beneath the ſurface of the earth, and what they are?

30. WHETHER there be any proper or peculiar ſigns, that ſhow it to be hopeleſs, or at leaſt unlikely to find a vein in the place where it is digged for, and what thoſe are?

About the fourth title.

31. WHAT is the depth of the ſhaft or groove (which though named in the ſingular number, the queſtions about it are generally applicable) till you come at the vein or ore?

32. WHETHER the vein run, or lye horizontally, or dip? And, if it dip, what inclination it hath, how deep the loweſt part lyes, and conſequently how much deeper than the uppermoſt? As alſo, what its flexures, if it have any, are? And whether it runs directly north or ſouth, eaſt or weſt; or ſeem rather to have a caſual tendency, than any determinate one by nature? And how far it reaches in all?

33. WHAT is the wideneſs of the groove at the top, and elſewhere? Whether the groove be perpendicular or crooked; and if crooked, after what manner, and with what diſtance it winds?

34. How the groove is ſupported? What are the kinds, length, bigneſs, and way of placing the timber, poles, *&c.* that are employed to ſupport it? And how long the wood will laſt, without being ſpoiled with the ſubterraneous fumes and waters? And what wood laſts longeſt?

35. WHAT air-ſhaft belongs to the mine? Whether it be ſingle or more than one? Of what breadth the air-ſhaft is at the orifice? Whether it be convenient enough, or not? How near it is placed to the groove, and in what poſition? And if there be ſeveral air-ſhafts, what their diſtances and ſituation are in reference to the groove, and to each other? Or how air is ſupplied, if there be no air-ſhafts?

36. WHETHER they meet with any waters in the mine? And, if they do, how copious they are; at what depths they occur, how they are qualified, and what way they ſpring, *&c.?*

37. WHETHER they are conſtant or temporary? whether they increaſe or diminiſh notably in ſummer or winter, or at any other time of the year, and if they do, at what ſeaſon that is; how long it is wont to laſt; and the proportions of increaſe and decreaſe?

38. WHAT expedients and engines are employed to free the mines from water? The materials, the parts, the bigneſs, the ſhapes, the coaptation; and in ſhort, the whole ſtructure, number, and way of applying the inſtruments, that are made uſe of to free the mines from water?

39. WHAT are the conditions, number, *&c.* of the adits?

40. WHETHER the mine be troubled with damps, and of what kind they are; whether they come often or ſeldom at any ſet time, or altogether irregularly; what ſigns forerun them; what miſchief they do; what remedies are the moſt ſucceſsfully employed againſt them, as well in reference to the clearing of the mine, as to the preſervation and recovery of the workmen?

41. WHAT methods the mine-men uſe in following the vein, and tracing their paſſages under ground (which they call plumming and dialling) according to the ſeveral exigencies? And whether they employ the inſtruments, made with the help of the loadſtone, the ſame way that is uſual; and if not, wherein they differ in the uſe of the ſame inſtruments; or what inſtruments they ſubſtitute in their place?

42. WHAT ways they take to ſecure themſelves from the uncertainty, incident to the guidance of magnetick needles from the iron-ſtone or ore, that they may meet with under ground? (of which yet perhaps there is not ſo great danger, as one may imagine; as far as I could find by a trial, I purpoſely made in a groove, where I was ſure there wanted not iron ore.) And what other ways may be

uſed

uſed to direct miners without the help of a loadſtone?

43. How the miners deal with the rocks and ſpars they often meet with, before they come at the ore? Whether they uſe fire to ſoften, calcine, or crack them? How they employ it, and with what meaſure of ſucceſs?

44. WHAT ways and cautions they uſe to free the mine and ſecure the workmen from the inconveniencies and danger accruing from the uſe of much fire in it?

45. WHAT inſtruments they uſe to break the rock, *&c.* And how thoſe inſtruments are conducive, and how long they laſt?

46. How the mine-men work, whether naked or clothed? And what lights they uſe to work by, what materials they are made of, what meaſure of light they give, how long they laſt? And by what ways they are kept burning in that thick and foggy air?

47. How veins are followed, loſt, and recovered? And how ſeveral miners work on the ſame vein? And what is the beſt way of getting all the ore in a vein, and moſt conveniently?

48. How they convey out their ore and other things, that are to be carried out of the mine? Whether they do it in baſkets drawn up by ropes, or upon men's backs; and if this laſt named way, what kind of veſſels they uſe for matter, ſhape, and capacity? And whether the workmen deliver them one to another, or the ſame workmen carry them all the way? And whether the diggers deſcend and aſcend by ladders of wood, or of ropes, *&c.?*

About the fifth title.

49. WHETHER the ore runs in a vein, or lye diſperſed in ſcattered pieces; or be divided partly into a vein, and partly into looſe maſſes; or like a wall between two rocks, as it were in a clift, or be interſperſed in the firm rock, like ſpeckled marble? Or be found in grains like ſand or gravel; as ſtore of excellent tin is ſaid to be found in ſome parts of *Cornwall* at the ſides and in the channels of running waters, which they call . . . . . ; or whether the ore be of a ſofter conſiſtence, like earth or lome, as there is lead ore in *Ireland* holding ſtore of ſilver; and iron ore in the north parts of *Scotland* and elſewhere? And what is obſervable in it as to weight, colour, mixture, *&c.?*

50. WHETHER any part of the metal be found in the mine perfect and complete? (As I have had preſented me good valuable copper, and pieces of perfect lead, that were taken up, the one at *Jamaica*, and the other by an acquaintance of mine, that took them out of the ground himſelf in *New England.*)

51. WHETHER the mine affords any parcels of metal, that ſeem to grow like plants? (As I have ſometimes ſeen ſilver growing, as it ſeemed, out of ſtone, or ſpar almoſt like blades of graſs; as alſo great grains of a metal, which appeared to me, and which thoſe, that tried ſome of it, affirmed to be gold, abounding in a ſtony lump, that ſeemed to conſiſt chiefly of a peculiar kind of ſpar.)

52. WHETHER the vein lye near, or much beneath the ſurface of the earth, and at what depth?

53. WHETHER the vein have or have not any particular concomitants, or coats (if I may ſo call them;) and, if any, what they are, and in what order they lye? (As the veins of lead ore with us, have frequently annexed to them a ſubſtance called ſpar, and next to that another called caulk.)

54. WHETHER (beſides theſe coats) the vein have belonging to it any other heterogeneous ſubſtance? (As in tin-mines we often find, that yellow ſubſtance, which they call mundick.)

55. WHAT are the principal qualities of theſe extraneous ſubſtances? (As that ſpar is white, but tranſparent, almoſt like coarſe cryſtal, heavy, brittle, eaſily diviſible into flakes, *&c.* Caulk is of a different texture, white, opacous, and like a ſtone, but much more ponderous. Mundick I have had of a fine golden colour; but, though it be affirmed to hold no metal, yet I found it in weight, and otherwiſe, to differ from marchaſites; and the mine-men think it of a poiſonous nature.)

56. WHETHER the vein be incloſed every way in its coats, or whether it only lye between them?

57. WHETHER the vein be every way of an uniform breadth, and thickneſs; and, if it be, what theſe dimenſions are; and, if not, in what places it varies, and in what meaſure? (The like queſtions are to be made concerning the ſpar, caulk, and other teguments or mixtures of the ore.)

58. WHETHER the vein be uninterrupted, or in ſome places broken off; and whether it be abruptly or not; and whether it be by vales, brooks, gullets, *&c?*

59. How wide the interruptions are; what ſigns whereby to find the vein again; whether the ulterior part or diviſion of the vein be of the ſame nature, and hold on in the ſame courſe, as to its tendency upwards or downwards, or horizontally, northward, ſouthward, *&c.* with the vein, from which it is cut off?

60. WHETHER, in caſe the laſt end of the vein be found, it terminate abruptly, or elſe end in ſome peculiar kind of rock or earth, which does, as it were, cloſe or ſeal it up, without leaving any crack or cranny, or otherwiſe? And whether the terminating part of the vein tend upwards, downwards, or neither? And whether in the places, where the vein is interrupted, there be any peculiar ſtone or earth, that does, as it were, ſeal up the extremity of it?

61. WHETHER it be obſerved, that the ore in tract of time may be brought to afford any ſilver or gold, which it doth not afford, or more than it would afford, if it were not ſo ripe? And whether it have been found, that the metalline part of the vein grows ſo, that ſome part of the mine will afford ore or metal in tract of time, that did not ſo before?

And whether to this maturation of the mine, the being expoſed to the free air be neceſſary; or whether at leaſt it conduce to the acceleration of it, or otherwiſe?

62. WHETHER all the ore contained in the mine be of the ſelf-ſame nature and goodneſs; and, if not, what are the differing kinds, and how to be diſcriminated and eſtimated?

63. WHAT is the fineneſs and goodneſs of the ore, by which the mine is wont to be eſtimated? And what are the marks and characters, that diſtinguiſh one ſort from another?

64. WHAT proportion of metal it affords? (As in our iron mines it is obſerved, that about three tons of iron ſtone will afford one ton of metal: and I have had lead ore, which an ingenious man, to whom I recommended ſuch trials, affirmed to me to afford three parts in four of good lead.)

65. WHETHER the ore be pure in its kind from other metals, and, if not, of what metals it participates, and in what proportion? Which is eſpecially to be enquired into, in caſe the mine be of a baſe metal, that holds a noble metal: (as I have known it obſerved, that lead ore, that is poor in its own metal, affords more ſilver than other; and I remember, that the ore lately mentioned, being rich in lead, ſcarce afforded us upon the cupel, an atom of ſilver. And *Matthеſius* informs us, that a little gold is not unfrequently found in iron ore. And I have by me ſome gold, that never endured the fire, taken out of a lump of tin ore.)

About the ſixth title.

66. WHAT are the mechanick and previous operations, as beating, grinding, waſhing, *&c.* that are uſed to ſeparate the ore from the heterogeneous bodies, and prepare it for the fire? Or whether the ore requires no ſuch preparation? (as it often happens in lead, and ſometimes in iron, *&c.*)

67. WHETHER mercury be made uſe of to extract the nobler from the baſer metals? (as is their practice in *Peru*, and other parts of the *Weſt Indies.*)

68. WHETHER the leaving the ore expoſed to the open air and rain for a good while, be uſed as a preparative? (as I have ſeen done in iron-ſtone.)

69. WHETHER the burning and beating of the ore be uſed to prepare it for the furnace? (as is practiſed in iron, and almoſt always in copper:) and in caſe they uſe more than once, how often they do it; (for copper ore is in ſome places waſhed eight or ten times, and in others twelve or fourteen) and with what circumſtances; as how long the ignition laſts at a time, whether the ore be ſuffered to cool of itſelf, or be quenched? Whether it be waſhed betwixt each ignition?

70. WHAT flux-powders, and other ways they have to try and examine the goodneſs of the ore in ſmall quantities?

71. WHETHER when they work in great, they uſe to melt the ore with any flux or additaments, or only by the force of the fire, or in any way between both? (as throwing in of charcoals, when they melt iron-ſtone, does not only ſerve to feed the fire, but perhaps by the alcali of its aſhes to promote the fuſion; ſo lime-ſtone, *&c.*)

72. WHAT kind of furnaces they uſe to melt the ore in, whether they be all of one ſort and bigneſs, or of differing?

73. WHAT are the ſituation, materials, dimenſions, ſhape, bigneſs, and in ſhort, what is the whole ſtructure and contrivance of the furnace? If there be any thing peculiar and remarkable? What tools are uſed in ſmelting their figures, uſe, *&c.* and the whole manner of working?

74. WHAT kinds of fuel, and what quantities of it are wont to be employed in the furnace, within the compaſs of a day, or week? How much is put in at a time? How often it is renewed? And how much ore in a determinate time, as a week, or a day, is wont to be reduced to metal?

75. IN caſe an additament be employed, what that is, and in what proportion it is added? Whether it be mingled with the ore, before that be put into the fire, or caſt in afterwards, and if ſo, at what time, *&c.?*

76. WHETHER the ore be melted by a wind, excited by the fire itſelf, as in wind-ovens? Or by the courſe of waters? Or acuated by the blaſt of bellows; and if ſo, whether theſe bellows be moved by a wheel, turned by water running under it, or falling on it? And what are the dimenſions, ſituation, *&c.* of the bellows?

77. WHAT contrivance they have to let or take out the metal, that is in fuſion, and caſt it into bars, ſows, pigs, *&c.?*

78. WHAT clay, ſand, or mould they let it run or pour it through? And after what manner they refrigerate it?

79. WHETHER or no they do either to facilitate the fuſion, or to obtain the more or better metal, mingle differing ſorts or degrees of ore of the ſame metal? As in ſome places it is uſual to mingle poor and rich ore; and at *Mendip* they mix two or more of thoſe differing kinds of lead ore, that they call frim-ore, ſteel-ore, potern-ore, *&c.*

80. WHETHER or no, having once brought the ore to fuſion, they melt all the metal itſelf to have it the more pure? And, if they do, with what circumſtances they make the fuſion?

81. WHETHER they have any ſigns, whereby to know, whether the fuſion have been well or ill performed; and the metal have obtained the perfection to be expected from ſuch ore, melted in ſuch a furnace?

82. WHETHER they obſerve any great difference in the goodneſs of the metal, that firſt melts, from that of the reſt of the metal, which comes afterwards in the ſame or another operation? And whether the rule holds conſtantly? (For, though they obſerve in tin-mines, the beſt metal comes firſt; yet in the works of an induſtrious friend of mine, he informs me, that the beſt metal comes laſt.)

83. WHETHER

83. WHETHER the produced metal be all of the ſame goodneſs? And, if it be, how good it is in reference to the metal of other mines, or other parts of the ſame mine or vein? And, if it be not, what differences are obſerved between the produced portions of metal, and what diſparity that amounts to in the price?

84. WHAT are the ways of diſtinguiſhing them, and eſtimating their goodneſs?

85. WHETHER they do any thing to the metal after it is once brought to a fuſion, and, if need be, melt it over again, to give it a melioration? (as when iron is refined, aud turned into ſteel,) and what diſtinct furnaces, and peculiar ways of ordering the metals, are employed to effect this improvement? With a full deſcription of them and the tools in all circumſtances, obſerved in the refining of metals.

86. WHETHER in thoſe places, where the metal is melted, there be not elevated ſome corpuſcles, that ſtick to the upper parts of the furnace, or building? And, if there be, whether they be barely fuliginous and recrementitious exhalations, or at leaſt in part metalline flowers? (As in the Corniſh tin-mines, after ſome years they uſually deſtroy the thatched houſes, where the ore hath been melted, to get the ſtuff, that adheres to the inſides of the roofs, out of which they melt ſtore of excellent tin.)

87. WHETHER the metal being brought to fuſion affords any recrements? (As iron ſtone affords ſtore of a dark glaſs or ſlagg) and if it do, what thoſe recrements are? How they are ſeparated from the metal? And to what uſes they are employed?

88. WHETHER, after the metal has been once melted, the remaining part of the ore being expoſed to the air, will in tract of time be impregnated, or ripened, ſo as to afford more metal? (For this is affirmed to me of the Corniſh tin ore; and what remained after the fuſion of iron ore in the foreſt of *Dean*, is ſo rich in metal, that a tenant of mine in *Ireland*, though he had on the land he held from me, an iron mine, found it leſs profit to work it, than to ſend croſs the ſea to the foreſt of *Dean* for this already uſed ore, which having lain for ſome ages, ſince it was thrown aſide in great heaps expoſed to the air, he affirmed to yield as well great ſtore of iron, as very good; though I ſomewhat doubt, whether this be totally to be aſcribed to the air and length of time, or to the leaving of metal in the ſlaggs in old times, before great furnaces were in uſe.)

Promiſcuous enquiries about mines, from the ſame author.

1. WHETHER the territory, that bears the mine, abounds with no other kind of mineral in diſtinct parts of it? (As in *Kent* near *Tunbridge*, one part of the country which is hilly, abounds all along with iron-mines; the other, which is alſo hilly, and divided from it but by a ſmall valley, abounds exceedingly (as the diggers and inhabitants told me upon the place) in quarries, which the metalline country wants, but is quite deſtitute of iron-ſtone. And ſo at *Mendip*, in one part of the hill, I ſaw ſtore of lead-mines, containing ſeveral kinds of ore of that metal; another part of the hill I found to be full of coal pits, which had ſome marchaſites, but no metal; and in another place, iron ore, and mixed with ores, which yet they did not think fit to work.)

2. WHETHER the air appear to be really cold in ſummer, and hot in winter at the bottom of the mines, by ſurer proofs than the teſtimony of our touch?

3. WHETHER they ever meet with places and ſtones actually very hot, as *Matthefius* relates? And whether that ſpring not from the quenching of marchaſites?

4. WHETHER they find in the mines any mineral gelly, ſuch as the German naturaliſts call ghur? And whether in proceſs of time it will harden into a metal, or mineral concretion?

5. WHAT are the laws, conſtitutions, and cuſtoms, œconomical, political, ethical, that are received and practiſed among the minemen?

6. WHETHER the diggers do ever really meet with any ſubterraneous demons; and, if they do, in what ſhape and manner they appear; what they portend, and what they do, *&c.*?

7. WHETHER they obſerve in the trees and other plants, growing over or near the mine, not only (as hath been already intimated) that the leaves are any whit gilded or ſilvered by the aſcending mineral exhalations, but alſo, that the trees or other plants are more ſolid and ponderous? And if they have not alſo ſome diſcernible metalline or mineral concretes, to be met with in the ſmall cavities and pores of their ſubſtance?

8. WHETHER there be not ſprings, and alſo greater ſtreams of water near the mine, that riſe, and run their whole courſe under ground, without ever appearing above it?

9. WHETHER the ſubterraneous ſprings do riſe with any wind or determinate change of weather?

10. How much heavier the atmoſphere is at the bottom of the mine, than at the top? And whether damps conſiderably increaſe the weight of it?

11. WHETHER they find any ſtrange ſubſtances in the mines, as veſſels, anchors, fiſhes incloſed in ſpar or metal, *&c.*?

A

PAPER

OF THE HONOURABLE

ROBERT BOYLE's,

Depoſited with the Secretaries of the Royal Society, *October* 14, 1680. and opened ſince his Death; being an Account of his making the Phoſphorus, &c.

Printed firſt in the *Philoſophical Tranſactions*, N° CXCVI. p. 583. January 1692-3.

Sept. 30. 1680. THERE was taken a conſiderable quantity of man's urine, (becauſe the liquor yields but a ſmall proportion of the deſired quinteſcence) and of this a good part at leaſt, had been for a pretty while digeſted before it was uſed. Then this liquor was diſtilled with a moderate heat, till the ſpirituous and ſaline parts were drawn off; after which the ſuperfluous moiſture alſo was abſtracted (or evaporated away) till the remaining ſubſtance was brought to the conſiſtence of a ſomewhat thick ſyrup, or a thin extract. This done, it was well incorporated with thrice its weight of fine white ſand; and the mixture being put into a ſtrong ſtone retort, to which a large receiver (in good part filled with water) was ſo joined, that the noſe of the retort did almoſt touch the water: then the two veſſels being carefully luted together, a naked fire was gradually adminiſtred for five or ſix hours, that all that was either phlegmatick or volatile might come over firſt. When this was done, the fire was encreaſed, and at length for five or ſix hours made as ſtrong and intenſe as the furnace (which was not bad) was capable of giving: (which violence of fire is a circumſtance not to be omitted in this operation.) By this means there came over good ſtore of white fumes, almoſt like thoſe, that appear in the diſtillation of the oil of vitriol; and when thoſe fumes were paſſed, and the receiver grew clear, they were after a while ſucceeded by another ſort, that ſeemed in the receiver to give a faint bluiſh light, almoſt like that of little burning matches dipped in ſulphur. And laſt of all, the fire being very vehement, there paſſed over another ſubſtance, that was judged more ponderous than the former, becauſe it fell through the water to the bottom of the receiver; whence being taken out, (and partly even whilſt it ſtayed there,) it appeared by ſeveral effects, and other phænomena, to be ſuch a kind of ſubſtance as we deſired and expected.

A N

A C C O U N T

OF THE HONOURABLE

ROBERT BOYLE's Way of examining Waters, as to Freſhneſs and Saltneſs.

To be ſubjoined as an Appendix to his lately printed Letter about the ſweetned Sea-Water, *October* 30, 1683.

Printed firſt in the *Philoſophical Tranſactions*, N°. CXCVII. p. 627.

I. HAVING ſince the publication of the foregoing letter, been commanded by the king, to ſhow his majeſty an experiment of the way herein mentioned, to examine the freſhneſs and ſaltneſs of waters; I did in his preſence (and that of his royal highneſs, his grace the duke of *Grafton*, and ſeveral perſons of quality) make trial of it, both upon ſome water prepared according to the patentees way, and upon two or three natural waters, that were ordered to be brought. In all which trials (in ſome whereof his majeſty, for greater certainty, was pleaſed to employ his own hands) the ſucceſs was ſuch, as moved him to vouchſafe the experiment the honour of his ſpecial approbation, and to give me an encouraging permiſſion to communicate it, as a thing, that may prove not unuſeful to the publick. This I think fit to mention, not only to procure to my way of trying waters, the high advantage of a royal, and (on philoſophical accounts) illuſtrious patronage; but that, if this method be found as beneficial as I wiſh it may, men may know, to whom they ought to acknowledge the early publication of it. This is all my haſte allows me to premiſe to the account I am going to deliver of the way of trying waters hitherto ſpoken of: which account I ſhall ſet down, as I drew it up to be diſpatched to a friend, in caſe I ſhould have his majeſty's permiſſion to impart it to him.

II. MY way of examining the freſhneſs and ſaltneſs of waters, though (becauſe it is wont to be ſurpriſing the firſt time one ſees it tried, and has had the luck to be much talked of in many good companies) it is thought to be an invention very difficult, to be either found out or practiſed, is yet really no ſuch myſterious thing as men imagine it. And for my part, I hope it will be found much more conſiderable for its uſe, than I think it is for the degree of ſkill and ſagacity, that was neceſſary to deviſe it. For when I remembered and conſidered, that (as I have found by various trials) divers metalline and other mineral ſolutions could be readily precipitated, not only by the ſpirit of ſalt, but by crude ſalt, whether dry or diſſolved in water, it was no very difficult matter for me to think, that by a heedful application of the precipitating quality of common ſalt, one might diſcover, whether any particles of it, (at leaſt in a number any way conſiderable) lay concealed in a diſtilled water, or any other propoſed to be examined.

III. TO find, whether I was not miſtaken in this conjecture, as alſo becauſe it is very convenient to be as little as one can confined to one material, I employed ſeveral drugs, and thoſe not at all prepared by one menſtruum, to make the intended diſcovery. And, though two or three of my other trials had ſucceſſes, that I diſliked not when I made them, yet that, which at length I pitched upon as the moſt certain, and which therefore I meant, when I had the honour to be ſent for by his majeſty about the patentees water, was that, which I think may be beſt underſtood, as well as recommended by this ſhort narrative.

IV. I TOOK ſome common diſtilled water in glaſs veſſels, that it might leave its corporeal ſalt, if it had any, behind it, and put into a thouſand grains of it one grain of dry common ſalt: into a convenient quantity, for example, two or three ſpoonfuls of this thus impregnated liquor, I let fall a fit proportion, for inſtance, four or five drops, of a very ſtrong and well filtrated ſolution of well refined ſilver, diſſolved in clean aqua fortis; [for a ſhift, common or ſterling ſilver will ſerve the turn:] and I made the experiment N. B.

N. B. This paſſage was depoſited with the Secretaries of the Royal Society, *An.* 1683. ſealed up and opened ſince the author's death.

* Which ſhould have been to the worthy doctor *John Beal*, to whom the letter this paper refers to was written; but to the author's grief, and the great loſs of the commonwealth of learning, he died before this paper was written.

ſucceed

ſucceed with ſpirit of nitre, inſtead of aqua fortis, upon which there immediately appeared a whitiſh cloud, which though but ſlowly, deſcended to the bottom, and ſettled there in a white precipitate.

V. THIS experiment having been ſeveral times, for the main of it, reiterated with ſucceſs, I thought fit to keep conſtant to the way of probation I made uſe of in it, (and which trials had recommended to me for between 20 and 30 years) though (by reaſon of ſome things, that haſte forbids me to mention) I pitched upon this way without at all denying, that men of ſagacity, eſpecially if well verſed in chemical operations, may upon the ſame ground that I went upon, find ſome other and cheaper ways, though ſcarce any more nice and certain of compaſſing the ſame end.

VI. AFTER what has been hitherto ſaid, I preſume I may ſeaſonably proceed, to ſubjoin the four enſuing advertiſements.

AND firſt, I ſhall give notice, that to make the experiment rather ſeverely, than at all favourably, there was uſually taken ſomewhat more than a thouſand parts of water to one of ſalt.

VII. NEXT I obſerved, that having let fall a few drops of our metalline ſolution into the liquor obtained from the ſea-water by the patentees way of ſweetning it, there did not preſently enſue any white cloud or precipitate, much leſs ſuch an one as had been newly afforded by the water, that was impregnated with leſs than a thouſandth part of ſalt. And if after ſome time there happened to appear, (for it is not abſolutely neceſſary it ſhould) a little cloudineſs in this fictitious liquor, it was both ſlowlier produced, and much leſs than that, which appeared in the impregnated water *.

IX. THIRDLY, the uſefulneſs of this experiment is not to be eſtimated only by the examen, it helps us to make of dulcified ſea-water, but much more by the eſtimate, that by its means may be made of natural freſh waters, whether ſprings, rivers, clouds, lakes, wells, *&c.* For it being generally granted, that thoſe waters, *cæteris paribus*, are the beſt, as well for the wholeſomneſs, as divers œconomical uſes, as waſhing, brewing, *&c.* that are freeſt from ſaltneſs, which is an adventitious, and in moſt caſes, a hurtful quality in waters; by our way of examining theſe liquors, a heedful eye may in a trice diſcover, whether there be any latent ſaltneſs in them, (as moſt waters imbibe from the ſoil they have traverſed, or do ſtagnate in) and may enable one, eſpecially by the help of a little practice, to give a near gueſs, how much one water is freſher than another, as I have purpoſely tried with pleaſure in differing waters, that were ordinarily drunk, even by conſiderable perſons. And if once you have attentively marked, what change four or five drops, for inſtance, of our diſcovering liquor will make in two or three, or ſome other ſmall determinate number of ſpoonfuls, (or rather of half ounces) of water; it will not be difficult for a heedful obſerver, keeping the ſame proportion between the two liquors, to make a near eſtimate, whether any natural water propoſed to him have a greater, an equal, or a leſſer degree of freſhneſs or ſaltneſs, than that water, that he has choſen for his ſtandard; and how much, in caſe there be a difference, the propoſed liquor is leſs or more free from ſaltneſs than the other.

AND that (to add this by the by) ſuch a difference in a liquor of ſuch frequent inward uſe as water (which is the baſis of beer, ale, mead, and ſome other common drinks) may have conſiderable effects upon human bodies in reference to health, may be probably argued from the differing effects, that waters more or leſs impregnated with ſalt have upon divers other bodies. Since moſt pump waters, for inſtance, will not boil peas and beef, and ſome other aliments, near ſo well as ſpring-water or rain-water, which are uſually ſofter, and more free from the ſaltneſs we ſpeak of. It is commonly known to barbers and laundreſſes, that the ſame pump-water will not ſo well and uniformly, or without little curdlings, diſſolve waſh-balls and ſoap, as rain-water, and ſome running waters uſually will: nay, when I was curious of tempering ſteel, I remember it was confeſſed by the ſkilfulleſt artiſts I made uſe of, that ſome tools, (as gravers, *&c.*) made of that hardeſt of metals, would receive a differing temper, if they were X.

* VIII. And perhaps it may be proper, that I here obſerve (what is not wont to be taken notice of) that divers ſolutions of mineral bodies may be precipitated by dilution, that is, (to explain this expreſſion) when the ſolution has time enough allowed to diffuſe itſelf, through a great quantity of water, the ſaline parts are thereby ſo diluted and weakned, that they are no longer able to ſuſtain the mineral corpuſcles, they kept ſwimming before, but make with them, and the water, a confuſed and ſubſiding mixture, uſually of a whitiſh colour. This may appear, when the butter of antimony, being put into common water, is thereby quickly and plentifully precipitated in the form of that white powder, that chemiſts (not over-deſervedly) call mercurius vitæ. To which I may add, that I have alſo produced a powder of that colour, by pouring into common water a ſtrong ſolution of tin glaſs made in aqua fortis. And by the ſame way we have precipitated the tincture for ſolutions of the finer parts) of julap, benjamin, true labdanum, antimonial ſulphur, and divers other bodies made in vinous ſpirits. If it were not for this power, that water has to weaken moſt ſolutions of bodies, I could have employed, inſtead of that ſilver, either quickſilver diſſolved in aqua fortis, or lead crude or calcined in the ſame liquor, or (which is more convenient) in ſtrong ſpirit of vinegar; ſince theſe, and ſome others, are found to be precipitable by ſalt water into whitiſh powders. But though a very heedful obſerver may, for a ſhift, make uſe of theſe metalline ſolutions, to gueſs at the quality of water, as to freſhneſs and ſaltneſs; yet the precipitation, that is made by dilution, is not difficult to be diſtinguiſhed from that which is performed by a true and proper precipitant, (as in our caſe by the common ſalt, that is harboured in the pores of the water) both by the quickneſs of the effect, and the copiouſneſs of the white ſubſtance produced, and on both thoſe accounts is very much inferior to it, as may evidently appear in the very different effects, that our ſolution of —— had upon the patentees water, or upon well diſtilled common water, compared with thoſe it had upon water impregnated with a thouſandth part of ſalt, and upon divers common undiſtilled waters. This advertiſement I have placed in the margin, as not thinking it fit either to omit it, or by inſerting it in the body of the writing, to give too great an interruption to the ſeries of my diſcourſe.

quenched

quenched in pump-water, from that, which the like extinction in ſpring water, or river water, would give them. But how to make our eſtimate of the freſhneſs or ſaltneſs of water come neareſt the truth, is a problem, of which I have now neither time nor conveniency enough to deliver my thoughts. And by what has been ſaid, I hope it does already ſeem ſufficiently probable, that the way above propoſed may prove of good uſe, both to navigators, that are often neceſſitated to water in unknown places, and to others, that only, or frequently drink that liquor, without having any better way than the taſte, (which is but an incompetent one) to eſtimate its freſhneſs and ſaltneſs by *.

XII. FOURTHLY (and laſtly) though both in my letter to Dr. *I. B.* and in this preſent poſtſcript, I did not for certain reaſons aſcribe to our method of examining waters, a greater nicety, than to be able to diſcover one part of ſalt in a thouſand of water, that proportion being great enough to recommend it, and expreſſed by a round number eaſy to be retained in one's memory: yet I would not have it thought, but that, if it were requiſite, our method may make more nice diſcoveries. For having ſometimes, for curioſity's ſake, put one grain of ſalt into no leſs than fifteen hundred of diſtilled water, we could manifeſtly, (though not quite ſo conſpicuouſly as before) make it appear by our way, that even this ſo lightly impregnated liquor was not devoid of ſalt, but had more of that in it, than ſome of the patentees water, that I kept by me, had; nay, I once found, that a grain of dry ſalt, being diſperſed through two thouſand, and another time, that being diſſolved in three thouſand times its weight of the ſame kind of liquor, ſo inconſiderable a proportion of ſalt was plainly diſcoverable by our precipitant.

XIII. BUT here philoſophical candour forbids me to conceal an objection, that I made to myſelf, though it be the chief, if not the only conſiderable ſcruple, that occurred to me, about our way of examining waters. For I foreſaw, that it may be objected, that, whereas the experiments hitherto mentioned have been tried only upon waters impregnated with groſs or corporeal ſea-ſalt, this perhaps may not hinder, but that they may be imbued with the ſpirits of marine ſalt, which, by reaſon of their activity, may be as unhealthful to the drinker, as the groſſer ſalt itſelf. But though to this ſurmiſe I might anſwer, that a very ſmall proportion of ſpirit of ſalt may in many caſes make the water ſeaſoned with it, rather medicinal than unwholſom; yet I ſhall anſwer more directly to the objection, by ſaying, that to manifeſt its not being well grounded, I took above a thouſand grains of diſtilled water, and inſtead of corporeal ſalt, put to it one ſingle drop of moderately ſtrong ſpirit of ſalt, (for I had much ſtronger by me, that I purpoſely declined to employ) and having ſhaked it into water, I let fall into a portion of this unequally compoſed mixture ſome drops of our ſolution of ſilver, which preſently began to precipitate in a whitiſh form; inſomuch, that, for ought appeared to the eye, this trial ſucceeded better, than if the water had been impregnated with but a thouſandth part of corporeal ſalt. The like experiment was made with the patentees water inſtead of the other. And to purſue this trial a great way farther, I had the curioſity to diffuſe one drop of ſpirit of ſalt into two thouſand grains of diſtilled rain water; and upon letting fall ſome drops of our precipitant into it, I found, that the ſucceſs well anſwered my expectation. And then, to urge the trial yet farther, I added as much of the ſame diſtilled rain water, as by a modeſt conjecture made it amount to at leaſt as much more. So that one grain of ſpirit of ſalt had a manifeſt operation, though not quite ſo conſpicuous as the former, upon above three thouſand grains of water, whoſe immunity from common ſalt we tried apart; and poſſibly, if the vial could have contained more, and would not have been, when filled, too heavy for our tender balance, the diſcolouration of the mixture would have been diſcernible, though but one grain of ſpirit of ſalt had been put upon four, or even five thouſand grains of water. And that a drop of the ſaline ſpirit we made uſe of, did not equal in weight a grain of dry ſalt, I found by this, that having let fall into a counterpoiſed piece of glaſs ten drops of that ſpirit, I found them to want near half a grain of nine grains weight; which way of eſtimating I choſe, as leſs ſubject to any conſiderable error, than that of weighing a ſingle drop by itſelf.

XIV. THE like trial I made by ſubſtituting above a thouſand grains of rain water, in the room of the like quantity of diſtilled water. And theſe two experiments I the rather mention, becauſe they do not only ſhow, how free the patentees water was from ſpirituous, as well as from corporeal ſea-ſalt; but alſo manifeſt, that, whereas it is the opinion of ſome ſeamen, and of a perſon, for whom I have a profound reſpect, that water ought to have a little ſaltiſhneſs to preſerve it; if this be really a deſirable quality in our artificial water,

* XI. I might add on this occaſion, that, whereas experience has informed ſeveral perſons, who have conſulted it, that divers medicinal waters, that are preſumed to owe their virtues to the participation either of metalline, or of other mineral bodies, do upon trial appear to leave ſometimes little, and ſometimes nothing behind them, except a kind of common ſalt; our precipitant may much aſſiſt men to diſcover, whether a mineral water, propoſed to be examined, do or do not contain ſuch a ſalt, and if it do, whether it contain it copiouſly or no. This I have tried upon more than one of our Engliſh mineral waters, and thereby found in a trice, that one, that is reputed of another nature, contained pretty ſtore of ſaline matter; and that another (which is ſtill, for ought I have learned, of an unexamined and unknown nature) is impregnated with a ſurpriſing plenty of ſaltiſh ſubſtance. But how and with what cautions our precipitant may be the moſt uſefully employed about the examen of medicinal and other mineral waters, belongs not to this place, (but to ‖ another.) Upon which account I forbear to declare the uſe I have ſometimes made of our precipitant, in examining the freſh urine of men, the ſerum of human blood, and other bodies belonging to what the chemiſts call the animal kingdom.

‖ About the examen of mineral waters.

it may in a trice be ſupplied with as much ſaltneſs, whether corporal or ſpirituous, as ſhall be required, and conſequently as will bring it to be equal in that quality to the common water of rivers, or of ſprings. And perhaps it will not be impertinent to add on this occaſion, that in ſome places, eſpecially lying in hot climates, it may ſometimes be of good uſe to know, whether on the account of the ſun's heat, or that of the ſubterraneal regions of the earth, the rain water is impregnated with volatile (not acid) ſpirits, like thoſe, that are diſtilled from urine, and which I have, for curioſity's ſake, obtained from a mineral body, native ſal-armoniac; upon which account I made a trial, that informed me, that if five or ſix drops of ſtrong ſpirit of urine (whoſe drops I obſerved to be but ſmall) were ſhaken into a thouſand grains at leaſt of diſtilled or rain water, impregnated with but one of ſalt, our precipitant would make a diſcovery of ſome ſaltiſhneſs in the liquor. And it were neither to be admired nor cenſured, if the patentees water ſhould ſometimes ſhow a change, when our precipitant is plentifully put or long kept in it, eſpecially that change being a more light one, than that I came from ſpeaking of; ſince, for ought I have yet obſerved, not only ſuch undiſtilled waters as are generally allowed to be freely potable, but even thoſe, that nature herſelf diſtils, are not always quite devoid of ſaltneſs. For I have found rain water, that I cauſed to be carefully ſaved, after the houſe-tops had newly been well waſhed with former rain, to grow a little troubled, if any ſtore of our precipitant were kept for ſome competent time in it. And being gently diſtilled off, it left a reſidence, which with a little of our ſolution afforded a far more ſuddenly made and copious precipitate, than had been produced with the like quality even of pump-water itſelf. And, though I have met with rain-water, that was more free from ſalt than any ſpring or river-water, that I remember I have examined; yet, having for curioſity's ſake, made a trial of ſnow-water, (which if the weather had been ſomewhat milder, would have been rain) this liquor, I ſay, which is thought to afford the lighteſt water of all natural ones, I manifeſtly found by our way of examining it, not to be devoid of ſaltneſs.

XV. But to return to the trial we made with the ſpirit of ſalt, theſe experiments may not a little confirm the patentees water. And whereas ſome have either really ſuſpected, or invidiouſly pretended, that even a moderate action of the fire upon water, will make it brackiſh and putrify; as I ſee no ſubſtantial grounds of this ſurmiſe, ſo it appears by the foregoing trials, that really the patentees water is not brackiſh, but is more free from ſaltneſs, than moſt of the waters men do without ſcruple drink. And if it were true, that this water ſhould not keep quite ſo long as others, yet that were no more than is objected (how truly I now enquire not) to the generality of diſtilled waters: and that this we ſpeak of may keep ſweet longer than is neceſſary in a ſhip, that can from time to time, within a few days, ſupply itſelf with freſh out of the ſea, may be gathered from theſe two things. The firſt is, that to ſatisfy myſelf, whether cloſeneſs would make the prepared water ſoon putrefy, (as ſeemed obvious to be ſurmiſed) or at leaſt afford dregs, I cauſed a pint, or a pound of it, to be hermetically ſealed in a vial, whereof I left by gueſs about a third part empty; and having above ſix weeks after held this veſſel againſt the light, I found the water to be clear and limpid; though I did not judge it had depoſited ſo much as the tenth part of a grain of feculency. And having opened the ſeal, and taken out a little of the liquor, I did not find it altered, either as to ſmell or taſte. The ſecond of the two things, that were to be mentioned, is, that I have kept the bottle of prepared water mentioned in my letter to Dr. *Beal*, in the ſame unſtopped veſſel ever ſince *March*, that is ſo long, that it is near eight months old, and yet it continues ſweet and well conditioned. And if that, which is called crudity in water, does conſiſt (as probably it oftentimes does) in certain groſs particles, that are mingled with the purely aqueous ones, it is likely, that the action of the fire may divide and diſſipate theſe into minuter particles, and thereby deſtroy the texture, that makes them hurtful; and by cauſing innumerable tumblings and rovings among the more earthy particles, give them opportunity to make little coalitions, whoſe weight precipitating them to the bottom frees the pure water from them.

XVI. And becauſe it is but too probable, that the unwholeſomneſs of divers waters proceed, not only, or perhaps not ſo much, from bare crudity, as from a great quantity of groſſer particles, that are not eaſy to be raiſed, becauſe of their being combined with fixed and earthy ones, that ſwim up and down in the water they impregnate, as ſilver or mercury does in a ſolution made with aqua fortis, or rather as the particles of ſalt do in pump-water, and many other common waters: on this account, I ſay, the patentees invention may very much correct ſuch waters, ſince by their way of ſweetning thoſe liquors, the truly aqueous parts are not only freed from the ſaline ones, but from the mineral, and other groſs and hurtful corpuſcles, that may have lain concealed in the liquor. As may be argued from hence, that having purpoſely in the gentle fire of a digeſtive furnace ſlowly diſtilled off a pound of the patentees water, it left us in the cucurbit ſo light and thin a feculency, that the bottom of the glaſs ſeemed to be rather ſullied than covered by it; and I did not judge, that the whole feculency, if we could have got it out, would have amounted to ſo much as two grains.

XVII. But to return, after this ſhort, and I hope not impertinent digreſſion, to what I was lately ſaying of the virtue of the fire, to correct the crudity of waters, I ſhall proceed and ſay, that perhaps it was upon ſome ſuch reaſons, (to which others might be added, if

I could in few words confirm paradoxical ones) that the laſt great duke of *Tuſcany*, when he drank water, (for it was not, as I perceive ſome have miſunderſtood, his only drink) preferred, for wholeſomneſs, that, which was diſtilled, to that which was not; and if herein that learned prince, and thoſe of the ſame opinion, were not miſtaken, it will highly recommend the uſefulneſs of the patentees invention to mankind: for I ſhall on this occaſion obſerve, that there are multitudes of waters, that are not conſiderably brackiſh to the taſte, that yet, by reaſon of ſome unheeded ſaltneſs, as in moſt pump-waters, are more frequently, by reaſon of crudity, not only unfit, or (at beſt) leſs fit, for divers oeconomical uſes, as waſhing, boiling of ſome meats, *&c.* but are very unwholeſom; ſometime to a degree, that makes them miſchievous to whole communities, and perhaps nations. Of this it were to be wiſhed, that it were harder to give inſtances. I remember I have ſeen a notable one, in thoſe high and unſightly tumours about the throat, which are obſerved by travellers to be exceeding common among thoſe, that inhabit the lower tracts of ground, that lye between the Rhætian, Helvetian, and ſome other neighbouring mountains; which monſtrous ſwellings are generally imputed to the ſnow-waters, that flow from the mountains, and make the uſual drink of the meaner ſort of people; whence it is obſerved, that perſons of better condition, who drink wine more than water, are either not at all, or far leſs troubled with theſe diſfiguring *goitres*, (as they call them.) But much more notable inſtances to our preſent purpoſe are afforded me by that great (and yet living) traveller, monſieur *Tavernier*, baron of *Aubonne*, who ſpeaking of a nation of Cafres or negroes, that comes ſometimes to trade with the Portugueſe from a remote part of *Africk*, informs us, that the water of their country is very bad, which is (ſays he) the reaſon that their thighs do ſwell, and it is a wonder to ſee any one of them free. Nay, which is far more, where he ſpeaks of the African kingdom (or empire) of *Monomotapa*, he has this memorable paſſage, "the natives "never live long, by reaſon of the badneſs of "the waters in the country. For at the age "of twenty five they begin to be dropſical, "ſo that it is a great wonder, if any among "them live above forty years." *Tavernier*'s travels, part II. book II. chap. 23. page 156.

XVIII. WHAT monſieur *Tavernier* delivers being taken for granted, it ſeems very probable, that theſe people may be much relieved, and be brought to live as long as other nations, if they had ſo compendious a way as that of the patentees, to provide themſelves plentifully with waters, whoſe crudity is corrected, its groſſer and heavier parts ſeparated, and its brackiſhneſs deſtroyed by the fire, as its action is regulated and helped by their invention.

[THE experiment mentioned in this paper was tried at a meeting of the Royal Society, *February* 17, 169½, by Dr. *Sloane*, with a ſucceſs anſwerable to the aſſertions of the honourable author, and that a drop or two of ſpirit of ſalt mixed with common water would be by the ſame method diſcovered.]

A FREE DISCOURSE AGAINST Cuſtomary Swearing. AND A DISSUASIVE FROM CURSING.

To the Right Honourable

RICHARD, Earl of *Burlington* and *Cork*,

Lord High Treaſurer of IRELAND,

And the Honourable

Sir *HENRY ASHURST*, Baronet;

Executors to the Honourable *ROBERT BOYLE*, Eſq;

IT has been an injury too often done to the memory of perſons eminent for knowledge, learning, and virtue, to have after their death ſuch works obtruded upon the world for theirs, as have been deſervedly ſuſpected; or, if theirs, yet were never intended by them, in that ſqualid, broken, and imperfect condition, to have been publiſhed. But as for this tract you were pleaſed to put into my hands to peruſe, it is not only certain, that it was wrote by the honourable perſon, whoſe name it bears; but alſo, that it was deſigned by him for the preſs, as ſome paſſages in it do apparently ſhew.

1647. AND if this noble and learned author thought it ſeaſonable for thoſe times of uncontrolled liberty and confuſion, in which it was wrote, it is as ſeaſonable, if not more, at the preſent; when that vice, againſt which it is directed, has of late years ſo far prevailed to the great diſhonour of our nation, as well as our religion, that the patriots of our country aſſembled in parliament have been thereby juſtly provoked to prepare that late bill (which ſince has paſſed the royal aſſent) for the better and more effectual puniſhment and ſuppreſſion of it. A deſign becoming ſo auguſt an aſſembly; and in the proſecution of which your honours muſt be eſteemed to have done conſiderable ſervice, eſpecially by the publication of this treatiſe, which has been ſo happily recovered, and by a ſingular providence reſerved, as it were, for ſuch a ſpecial ſeaſon and ſervice.

I am, moſt honoured,

your moſt humble,

and faithful ſervant,

JOHN WILLIAMS.

THE

THE PUBLISHER TO THE READER.

THESE two tracts againſt cuſtomary ſwearing and curſing, lately met with amongſt the papers of a perſon of quality, and an intimate acquaintance of the honourable Mr. *Robert Boyle*, tranſcribed by his own hand, were found upon peruſal, perfect and fitted for the preſs, except the cloſe of a dedicatory epiſtle to his noble ſiſter, the counteſs of *Kildare*, which (as far as appears by the copy) he had but juſt began.

THE year inſerted on the title page, as well as a paſſage or two in the former of theſe, ſhews, that it was penned towards the latter end of the late unhappy times, when he was about twenty years old; by which time (if I am not miſtaken) this was the third treatiſe he had prepared for the publick; the other two being that of *Seraphick Love*, afterwards printed, and an *Eſſay of miſtaken Modeſty*, referred to in this.

I CANNOT ſay, (though there is a ſenſible conformity between the ſtyle of theſe and others of his books) but that this honourable author, if he had been to write upon this argument in his riper years, might have given it a finer turn; and added, out of his vaſt ſtore of learning and thought, much to the weight and force of it. But there is in the management of it ſuch a ſtrain of modeſty and unaffected piety, ſuch an affectionate zeal for the honour of Almighty God, and ſuch a paſſionate concernment for the well-doing and happineſs of thoſe of his acquaintance, for whoſe uſe this ſeems more eſpecially deſigned; and in fine, ſo much truth, reaſon, and obſervation, (as the pleas and excuſes here undertaken and anſwered, ſhew) that muſt above all recommend it to ſuch, as have his name in remembrance and veneration.

A NAME, methinks, better than that of ſons, than of daughters, than that of blood and deſcent; and that ſhould provoke thoſe of eminent extraction and ſtation, to an imitation of ſo worthy and glorious an example.

WHAT happy inſtruments might they then be of good to mankind, by their wiſe conduct and their exemplary virtues! What a reſtraint would this lay, above that of laws, on their dependents and inferiors! For how would ſuch dare to offend, that are ſure to find no countenance or protection? And what protection or countenance could they expect from their ſuperiors, whoſe lives would be a continual reproof, and where they could find no more a precedent, than they do a law to encourage them in their wicked oaths and blaſphemies. To bring theſe vices into diſparagement, and to repreſent the folly, as well as the ſin of them to the better bred part of mankind, was the generous and pious deſign of this learned author; and of thoſe honourable perſons, that from their relation to him by blood or friendſhip have been concerned in the publication.

TOWARD the utter extermination of which amongſt us, there ſeems to be, as human means, nothing more neceſſary than the vigilance of our magiſtrates, who are now as well and fully empowered, as obliged by the law to ſee to the puniſhment of it; and for the due execution of which, they will moſt certainly have the good wiſhes, aſſiſtance, and prayers of all good men, and, which is more than all, the bleſſing and rewards of heaven.

I HAVE only this to add, that the ſecond tract, or letter, ſeems to proceed from the ſame hand with the firſt, being agreeable to it in the ſtile as well as the deſign of it; and ſo the naming Mr. *Boyle* in it is but a decent cover for the concealment of himſelf.

A

DISCOURSE

AGAINST

Cuſtomary Swearing.

THOUGH I doubt not, but that it is much more eaſy to make moſt ſwearers proſelytes than converts, and a taſk of leſs difficulty to convince their judgments, than to reform their practice; yet, that they may not have any colour to father upon ignorance, what is uſually the child of ſome much guiltier parent, it will be (poſſibly) no leſs uſeful than neceſſary, briefly to direct them to thoſe texts of ſcripture, where all thoſe, that acknowledge God's word, may find the condemnation of that vice.

FIRST then, the third commandment flatly forbids unneceſſary oaths, in terms, that are ratified by theſe words of our Redeemer, in St. *Matthew*'s goſpel; "Ye have heard what "hath been ſaid by them of old time, thou "ſhalt not forſwear thyſelf, but ſhalt perform "unto the Lord thy oaths: but I ſay unto "you, ſwear not at all; neither by heaven, "for it is God's throne, nor by the earth, *&c.*" Mat. v. 33, 34.

And a little under, "But let your commu- V. 37.
"nication be yea, yea; nay, nay; for what-
"ſoever is more than theſe cometh of evil."
The ſum of which prohibition is thus repeated by St. *James*, towards the cloſe of his catholick epiſtle; "But above all things, my James v. 12.
"brethren, ſwear not, neither by heaven,
"neither by the earth, neither by any other
"oath, but let your yea be yea, and your
"nay, nay, leſt you fall into condemnation."
And ſuitable to theſe clear paſſages of both teſtaments, the wiſe man characters a ſinner Ec. ix. 2.
by him, that "ſweareth;" and paraphraſeth a righteous man by him, that "feareth an "oath." So in *Hoſea*, ſwearing has the van of the moſt trying and provoking ſins in that Hoſ. iv. 2, 3.
ſame diſmal paſſage; "By ſwearing, and ly-
"ing, and killing, and ſtealing, and com-
"mitting adultery, they break out, and blood
"toucheth blood: therefore ſhall the land
"mourn, and every one that dwelleth therein
"ſhall languiſh with the beaſts of the field,
"and with the fowls of heaven; yea, the
"fiſhes of the ſea alſo ſhall be taken away."
And in another prophet we find this threat Zech. v. 3.
recorded; "And every one that ſweareth
"ſhall be cut off." Which paſſage might eaſily be reinforced with others of the ſame nature, if I did not think theſe, that are already alledged, abundantly ſufficient; where we pay not our faith to the number of the texts, but to the authority of the inditer.

BUT alas! how much more eaſy is it to make men condemn their ſins, than to perſuade them to forſake them? Certainly our underſtandings are (uſually) much honeſter than our wills; it being far eaſier to reconcile men's judgments to the truth, than their practice to their judgment. Cuſtomary and unneceſſary ſwearing (for that is the ſole enemy I undertake) is ſo confeſſedly unlawful, that they are aſhamed to defend it, that bluſh not to practiſe it; and even they renounce it in their opinions, that moſt cheriſh it in their diſcourſe. But methinks this knowledge of the ill they act ſhould make them apprehend that menace of our Saviour, which he threatens, "He that knoweth his maſter's Luke xii.
"will, and doth it not, ſhall be beaten with 47.
"many ſtripes:" for ſtumbles are more pardonable by night than by day; and the knowledge of what we do, whilſt it lends us direction, robs us of excuſe; and if it do not impede, it aggravates our faults; ſince he, that does what he condemns, condemns what he does. Upon which ſcore our bleſſed Saviour ſaid, "That *Tyre* and *Sidon* ſhould Mat. xi.
"feel a milder torment at the day of judg- 21, 22.
"ment, than thoſe ungrateful towns *Chorazin*
"and *Bethſaida*," where the light of his doctrine had ſhone ſo clearly, and the miracles of his life had been ſo familiar. And accordingly we may obſerve, that the devils, that had no tempter to their fall, have found no pardon for it; but having ſinned againſt ſo clear a light, are hopeleſsly reſerved in chains of utter darkneſs, to endure hideous torments unto all eternity.

SECT. I.

BUT that we may leave our ſwearer as little pretence as reaſon for his obſtinacy, let us ſingly and orderly examine his allegations, and tear off thoſe fig-leaves of evaſions and excuſes, the devil teaches him to ſow together, to hide his own deformity from himſelf.

PLEA I.

AMONGST theſe, the firſt allegation we are to remove, is this, that ſwearing is indeed a ſin, but that (as *Lot* ſaid of *Zoar*) it is but a "little one;" for were it of the blacker dye, Gen. xix.
in what a ſad condition were mankind, ſince the 20.
number of ſwearers is not inferior to that of men?

ANSWER

ANSWER. But certainly he, that ſeriouſly conſiders, whom the leaſt ſin offends, and what it merits; how infinite a juſtice, majeſty, and goodneſs, it provokes, and how intolerable and immortal a puniſhment is due unto it, will eaſily concede, that to believe any ſin otherwiſe than comparatively little, is in it ſelf an error abſolutely great; for the moſt dwarfiſh are to be called ſmall, but in the ſenſe, that the aſtronomers call the earth a point; for ſo indeed it is, compared to the firmament; but in it ſelf conſidered, it is ſo vaſt, that the ſpots and ſhreds of it are both the ſtage and the ſubjects of the ambition of conquerors, and the jars of monarchs. And truly, ſince the leaſt (unpardoned) ſin is ſufficient to damn us, methinks we ſhould as little ſlight petty faults, becauſe there are fouler crimes, as we do piſtols, now there are cannons uſed. But granting this aſſertion to be true in the general, it will forfeit that attribute in this application; for this ſin is one of thoſe, that are expreſly and by name forbidden in the ten commandments; where it is not only liſted among, but has the precedency of murther, theft, and of adultery; being the ſole commandment (ſave one) that has a threat annexed to the law; which in this paſſage is, "For the Lord "will not hold him guiltleſs that taketh his "name in vain." In which laſt words, the great lawgiver foreſeeing men would be very remiſs in the proſecution of a fault, in which their want of zealous piety makes them not to be concerned, declares that he himſelf will take the vindication of his honour into his own hands, and inflict himſelf the puniſhment of a crime, that fears it but from him. And then if thoſe treſpaſſes be not ſeverely dealt with, that are alone puniſhable by the ſupreme magiſtrate, let all conſider, what "a "fearful thing it is to fall into the hands of "the living God." Which brings into my mind a pretty extravagancy, that is reported of the Turkiſh laws; which puniſh blaſphemy (as they call it) againſt Mahomet with inevitable death, but enact no penalty upon the like diſhonour offered to God. Becauſe Mahomet (ſay they) is not in a condition to vindicate himſelf; but God is ever able to revenge his own affronts, and therefore they reſign that care to him. Who indeed many times has (in ſuch caſes) done it ſo ſoundly, and ſo much to the purpoſe, that thoſe ſaucy wretches have had cauſe to think it as poor a privilege, to have their oaths out of the cognizance of the laws of men, as thieving beggars do to be exempted from the danger of the beadle and the ſtocks, becauſe their crimes are reſerved for the gallows.

Exod. xx. 7.

Heb. x. 31.

BUT to reſume our proofs of the ſinfulneſs of ſwearing; admit the guilt of ſingle oaths were no leſs venial than is pretended, yet certainly, when in moſt ſwearers the frequency of ſwearing is ſo great, that one day may be guilty of more than a thouſand oaths; (theſe ſins not growing ſingle, as apples or cherries, but like grapes by cluſters; the ſwearer's devil having a title to the name of the Gadarene ſpirit, that, anſwering our Saviour, called himſelf Legion) their multitude cannot but render them conſiderable; and he, that remembers, that a thouſand holes may as well ſink a ſhip, as ſome great leaks, will conclude oaths to be extremely dangerous, at leaſt for their number, though they were not ſo for their heinouſneſs. Nor are they only ruinous to the perſons, that uſe them, but have a deſtructive influence upon that ſtate, that ſuffers them. For whether or no what the prophet related once of *Judah*, "Becauſe of ſwearing, "the land mourneth," be not a fulfilled prophecy of *England*, I wiſh it were rather charity than partiality to doubt. For though the multitude and variety of our ſins be ſo great, that it is a puzzling taſk to determine, to what particular crimes our calamities are due, yet certainly our oaths are too conſiderable an acceſſion to our ſins, not to infuſe a ſuitable proportion of gall and wormwood into that bitter cup (of affliction) theſe gaſping kingdoms drink ſo deeply of; and whatſoever feathered, I am confident our oaths have ſtrangely pointed thoſe fatal arrows, that deſtroy theſe nations.

Mark v. 9.

Jer. xxiii. 10.

As for the ſuppoſal this miſtake is built on (the involvedneſs of all men in the guilt of ſwearing) it is as weak, as it is uncharitable; for (beſides that to allow no body an innocence from ſwearing, is as much a ſlander to mankind in its preſent condition, as it would be its crime, if the accuſation were true) our Saviour gives us the world's example rather for a caution, than for imitation; where he tells us, that the way to hell is a road, and thronged with numerous travellers; but heaven's path is narrow, and the gate, that inlets to thoſe manſions of bliſs, as unfrequented as it is ſtrait. Even Mahomet himſelf (in his diſcourſe with the Jew *Adia*) having at the laſt day divided mankind into threeſcore troops, makes but three of them believers, and all the reſt reprobates. But certainly he, whoſe command this is, "Thou ſhalt not fol- "low a multitude to do evil," will hardly take the practice of that multitude for a juſt diſpenſation of the law of that God, who having commanded us to live by good precepts, will ſcarce accept it for an excuſe, that we have erred by bad examples. It would be a ſtrange abſurdity in phyſick, becauſe a peſtilence is more diſperſed and epidemical, to think it therefore the leſs dangerous; or to believe, that the multitude of ſtinking carcaſſes can leſſen the noiſomneſs of the ſtench. But as in pious duties the general concurrence contributes to the acceptation, ſo in ſins, the like conſent but haſtens on revenge; it being with the guilty kingdoms as with leaking boats, where the number of the paſſengers but makes them ſink more nimbly. And accordingly we read, that the univerſality of the Sodomites beaſtlineſs was ſo far from juſtifying each ſingle ſinner, that they were all conſumed with fire from heaven, for the ſole want of ten righteous perſons. It is for them only, that think it no miſery to burn in hell with others, to fancy it no ſin to ſwear with company: but for the reſt of men, let them

Matt. vii. 13.

Exod. xxiii. 2.

Gen. xviii. 32.

them take this from me, that ſins, whoſe ſeeming pettineſs makes them leſs formidable, do oftentimes prove the moſt dangerous; and he, that dares eſteem any ſin ſmall, may ſoon be brought to think none great.

PLEA II.

WELL, but objects the ſwearer, I do not ſwear ſo often, and my conſcience by ſeldom accuſing me of that ſin, aſſures me, that I do but unfrequently commit it.

ANSWER. But ſure in vice, whoſe eſſence conſiſts in a repugnance to mediocrity, every little is too much; and he, that ſwears feweſt oaths, ſwears yet too many by the whole number, that he ſwears. One oath is too many by one, when one is enough to damn. And who would ſwallow poiſon, becauſe obliged ſeldom to repeat his draught? To paſs over this, that the ſame conſiderations, that contract the number of your oaths, do aggravate their guilt, by arguing both a clearer knowledge of the ill you act, and a more bridling power to reſtrain it. But alas! how ſeldom does the ſilence of his conſcience make for the ſwearer? We know, that inſenſibility of pain may as well proceed from the deadneſs and ſtupifiedneſs of the part, as from a perfect and unmoleſted health. In fighting, that is held a heavier blow, that (ſtunning) takes away the ſenſe of pain, than that, which pains the ſenſe. Beware your tranquillity reſemble you not to the toad, that feels not poiſon, becauſe he is all poiſon; and reſents no alteration from it, becauſe it is natural to him. There are legions of ſwearers, in whoſe mouths cuſtom ſwears undiſcernedly; and who being taxed with it, (and believe what they ſpeak too) ſwear, that they are no ſwearers, and thus commit the fault they would wipe off the imputation of. But wiſe phyſicians hold it a fatal ſymptom, when excrements are voided without the patient's knowledge; and it is a ſign, that the thief has haunted long, when the maſtiff forbears to bark at him. In ſuch caſes, conſcience, like oppreſſed ſubjects under an armed tyrant, forbears expoſtulations, not out of want of the cauſes of complaint, but out of uſe of ſufferings. But certainly this lethargy of ſecurity is much more dangerous, than the fever of a reſtleſs conſcience; ſince in the one, the ſmart ſoon drives us to the ſearch of phyſick, but the other is ſo far from addreſſing us to remedies, that it never lets us know we need them. In ſuch ſtill conſciences, as in the ſea, the ſmootheſt ſeas, the ſmootheſt calms forerun the rudeſt tempeſts: for conſcience, when long forced to play the mute, turns to a ſcold at laſt; being like overladen muſkets, which, whilſt no fire comes near them, can ſcarce be known from them, that are not charged; but at the leaſt ſpark (of ſerious terror) that falls into the touchhole, they will be ſure to fly about our ears.

PLEA III.

TRUE; but (may you anſwer) there are others, that ſwear as much as I, and oftner; why then are not they more reprehended for more frequent faults?

ANSWER. To this I may reply in the terms of the apoſtle, "Am I therefore your "enemy, becauſe I tell you the truth?" And add out of *Solomon*, "That reproofs of in- "ſtruction are the way of life." "That po- "verty and ſhame ſhall be to the man, that "refuſeth inſtruction, but he, that regardeth "reproof, ſhall be honoured." And laſtly, "That he, that being often reproved, hard- "neth his neck, ſhall ſuddenly be deſtroyed, "and that without remedy." I know there are many *Sauls*, whoſe choler flames againſt thoſe *Davids*, that endeavour their diſpoſſeſſion, though they attempt the cure even with muſick, I mean, the mildeſt and the gentleſt way. But I muſt beg my ſwearer to conſider, that it is an inſpired writer, that aſſures me, "There is a generation, that are pure in "their own eyes, and yet is not waſhed from "their filthineſs." Your excuſe is juſt as if in an hoſpital a deſperate patient ſhould ſay to his phyſician, Why I can need no phyſick, for there are others here as ſick, and many more diſeaſed than I.

Gal. iv. 16. Prov. vi. 23. Prov. xiii. 18. Prov. xxx. 12.

To complain of being reprehended for vice, is to complain, that one is cared for; like the favourite child, that cries for having the knife taken away from him, when it is not from others, for whom we care not, whether they cut themſelves or no: which is as if our eyes had right to quarrel with us, for not enduring that duſt there, we ſuffer in our ſhoes. Certainly, as we deſerve not praiſe for other mens virtues; ſo can we not decline cenſure by the allegation of their faults. Take heed there be not places hot enough in hell, though others fry in more tormenting flames; and remember, that as it is not health to be not altogether as ſick as gaſping people; ſo it is but a very ſorry goodneſs not to be as bad as the worſt. How ſtrangely are our affections miſplaced! In tranſitory goods, which he rates juſtlieſt, that prizes leaſt, we think we never have enough, if any body elſe has more; but in the goods of the mind, which cannot be overvalued, we think our ſelves ſufficiently ſtored, if others enjoy leſs. We are diſcontented at another's wealth, and proud of his vices; and whereas his greater poverty ſhould exalt our gratitude, and his greater piety create our emulation, his riches make us envious, and his ſinfulneſs ſecure.

PLEA IV.

WELL, (may you reply) but I ſcorn to ſwear falſly; and what I know to be true, why may I not ſafely ſwear?

ANSWER. This weak objection ſatisfies many ſwearers, (ſo eaſily men believe what they deſire) but with as little reaſon as they ſwear with need: for that not falſe alone, but raſh and unneceſſary oaths are forbidden, appears evidently by the expreſſion made uſe of in the third commandment; where perjury is not alone condemned, but it is flatly written, "Thou ſhalt not take the name of the

" Lord, thy God in vain." Which if needleſs and cuſtomary ſwearing do not, it will be a ſtrange riddle to me, what the commandment means to prohibit. But that this is the genuine ſenſe and deſign of thoſe words, is cleared by theſe expreſs ones of our Saviour, (cited before in St. *Matthew*'s goſpel)
Mat. v. 33, 34, &c. " Ye have heard, that it hath been ſaid of " old time, thou ſhalt not forſwear thyſelf, " but ſhalt perform unto the Lord thine oaths. " But I ſay unto you, ſwear not at all, nei- " ther by heaven, for it is God's throne, nor " by the earth, *&c.*" And to this ſenſe the annexed affirmative precept expounds the negative law; the word communication in the former ſhewing the interdict to be chiefly meant of oaths employed in common diſcourſe and converſation. Nay, God himſelf ſeems manifeſtly to determine all the controverſy, by that clear diſtinction expreſſed in a paſſage of *Leviticus*, whoſe words run thus,
Lev. xix. 12. " And ye ſhall not ſwear by my name falſly; " neither ſhalt thou profane the name of " thy God: I am the Lord." And certainly if we muſt anſwer at the laſt day for every idle word, how much more will that account be exacted of us for every idle oath?

THE *Jews* at this day, (as I learned whilſt I lately converſed with them at *Amſterdam*) have ſo profound a reverence for that great name of Jehovah (commonly called Nomen Tetragrammaton, and ineffable, ſo frequently recorded in the ſcriptures) that they hold it unlawful for mortal lips ſo much as to pronounce it: but though I eſteem this fancy ſuitable enough to the reſt of the extravagancies of their modern tenents, yet certainly their ſuperſtition will condemn our irreverence. I remember an expoſitor obſerves upon the vith of *Deuteronomy*, and the 13th verſe, that the word there, which ſignifies ſwear, is put in the Hebrew in the paſſive ſenſe, to imply, that our ſwearing ought to be a kind of neceſſitated act. And a father tells us of one *Clinias*, a Pythagorean, who being fined in a great ſum of money, which he might have eſcaped with an oath, choſe rather to pay the penalty impoſed, than not to pay unto God the reverence, that he thought due unto his name. Beſides, he, that makes no conſcience of ſwearing vainly, will ſoon make but little of ſwearing falſely; for he, that in a lower degree ſo voluntarily breaks God's commandment for nothing, may ſoon be drawn to break it in a little higher degree for his profit.

AND though many of our gallants (doubtleſs in a pure compliment to the devil) are pleaſed to condemn the breach of this commandment, only when the ſinner wants the excuſe of an advantage by it; yet certainly, he, that uſes to toſs God's ſacred name in his mouth without any reverence, and employs it about every trifle, will eaſily be tempted not to care much what he does with it, nor to what uſe he puts it. And therefore holy *David* makes it a ſymptom of hatred againſt God, when in a pſalm he ſays,
Pſalm cxxxix. 20. " Thine ene- " mies take thy name in vain." Theſe conſiderations may clearly teach us, what to think of thoſe uſual forms of ſpeech, ſuch as are, God forgive me, God help you; and the like of thoſe cuſtomary exclamations, ſuch as are, O God! O Jeſus! and thoſe others, that are uſually employed to proclaim our wonders, or ſupply the want of a compliment, with an exceſs of irreverence: for though theſe unregarded treſpaſſes be in moſt perſons faults venial enough, as the effects rather of ignorance and heedleſſneſs, than of deſign; yet are they faſhions of ſpeaking, which, beſides that they are always needleſs, and often ſcandalous, do but inure our mouths to a very ſaucy ſlighting of that awful name, which eternally to praiſe, ſhall be in heaven both our employment and our happineſs.

PLEA V.

NOR will it avail the oathmonger to reply, But I do not take God's name in vain; for I ſwear not by God, or by Chriſt, or other oaths of the like nature, but only by the creatures, as by this light, by this bread, by heaven, and the like; and the creatures name I hope it is no ſin to take in vain.

ANSW. For ſure if we will allow our Saviour to be the beſt interpreter of his Father's commandments, he will teach us a very differing leſſon in thoſe (already twice alleged) words of St. *Matthew*; for doubtleſs he, that forbids to ſwear by heaven, the nobleſt, or by earth, the meaneſt ingredients of this vaſt fabrick of the world, intended, that prohibition ſhould reach all other creatures; which is as clear as light in the enſuing words of the 37th verſe of the ſame chapter, where Chriſt's expreſs injunction is, " But let your commu- " nication be yea, yea; nay, nay; for what- " ſoever is more than theſe, cometh of evil."
Mat. v. 34.

BESIDES, either by the thing you ſwear by, you mean God, or no; if the former, your guilt is evident in the breach of God's commandment; and if the latter, remember what the ſpirit ſays in *Jeremy*, " How ſhall I par- " don thee for this? Thy children have for- " ſaken me, and ſworn by them that are no " gods." And in effect, it is queſtionable in divinity, whether be the greater ſin, to ſwear falſly by the Creator, or with truth by the creatures; for as the former is an act of high impiety, ſo is the latter of idolatry: becauſe ſwearing by any thing being a part of divine worſhip, (as the paſſages the margin leads to, will evidence) implies in us an acknowledgment of ſome divinity in the thing we ſwear by; which, without omniſcience, is uncapable to diſcern the inward truth or falſehood of our oaths; and without omnipotence, unable to reward the one, or puniſh the other. A conſideration ſo prevalent with many of the primitive martyrs, that they choſe rather to expire in torments, than ſwear by the genius of the emperor. Nor is an oath only an act or ſpecies of divine worſhip, *If.* xlviii. 1. and xlv. 23. but by a ſynecdoche is taken for the whole worſhip, that men pay their Maker, in the lxiiid Pſalm, and the laſt, and in *Jer.* iv. 2.
Jer. v. 7.
Deut. vi. 13. & x. 20. Iſa. lxv. 16. Joſh. xxiii. 7. Jer. xii. 16. Exod. xxiii. 13.

PLEA VI.

ALLIED to this plea is theirs, that will not flatly ſwear by God, but by certain fictitious terms and abbreviatures, as by *Dod*, &c. and by the like diſguiſing of them believe to juſtify their oaths; as if they cared not, ſo (like *Saul* to the witch of *Endor*) they may go maſked to Satan.

1 Sam. xxviii. 8.

ANSW. To theſe I ſhall only anſwer with the apoſtle, "Be not deceived, God is not "mocked; ſince (as the ſame apoſtle elſe-where ſays) "He taketh the wiſe in their "own craftineſs." Well may this childiſh evaſion cheat our own ſouls, but never him, who judgeth as well as he diſcerns intents; and regards not ſo much the preciſe ſignification of your words, as what they are meant and underſtood for; which (in ſuch caſes) is uſually an oath, ſince the ſame credit is both given and expected upon theſe mongrel oaths, that is paid to thoſe they mean, but would not ſeem. Theſe people bring into my mind the bloody perſecutors of our firſt Chriſtians, who clothed them in the ſkins of ſavage beaſts, that it might ſeem no crime to worry them; for ſo theſe hypocrites diſguiſe God's name, to give themſelves the licenſe to diſhonour it.

Gal. vi. 7.

1 Cor. iii. 19.

IT is a very pretty ſlight of theſe gentlemen, to cozen the devil to their own advantage, and to find out by-ways to damnation, and deſcend to hell by a pair of back-ſtairs; and methinks argues a cunning much about the ſize of his, that pleaded he was innocent of falſifying the king's coin, becauſe he had diſplaced ſome letters in the motto. But to hell, as to towns, theſe ſingular by-paths (though leſs frequented) may lead directlier than the broad highways: and to theſe gentlemen, and thoſe that rely upon the laſt anſwered objection, I ſhall at preſent only recommend the ſerious pondering of that paſſage of the wiſe man in the Proverbs: "All "the ways of a man are clean in his own "eyes, but the Lord weigheth the ſpirits."

Prov. xvi. 2.

PLEA VII.

IT is a uſual excuſe of ſome ſort of ſwearers, that they ſwear only ſome peculiar oath, and that one kind of oath cannot amount to ſuch a crime as the more ſcrupulous pretend.

ANSW. An apology equally excuſing with the thief's, that ſhould alledge, that he commits all his robberies upon the ſame horſe; and the drunkard, that ſhould offer to juſtify his beaſtlineſs, by affirming, that he never foxes himſelf, but with one ſort of wine, or in ſuch a peculiar unaltered bowl. Remember what an apoſtle ſomewhere ſays of ſinning, "Whoſoever ſhall keep the whole law, and "yet offend in one point, he is guilty of all." Juſt as a man, that wounds the buck in the vitals, is truly and properly ſaid to have killed the deer, although the ſhaft reached but the head or heart, leaving the legs and other parts untouched. Thus in a globe, though there be numerous parts, yet he is guilty of breaking the whole globe, that breaks it but within the arctick circle, though near the equator it have eſcaped that violence; for whereſoever you break it, you break the globe; its eſſence conſiſting in the entireneſs, that is ruined by the fraction of any part. Sin, becauſe natural to us, is ſo readily learnt by us, that as in ſhooting, by practiſing to hit wrens and ſilly ſparrows, we learn the art of killing feldifares, thruſhes, and the other ſort of birds we never aimed at; ſo by committing ſome ſmall ſin, we learn, though inſenſibly (and perhaps undeſignedly) to commit other and groſſer kinds of ſins.

James ii. 10.

ONE act may make us do diſpoſitively, what *Moſes* is recorded to have done literally (at the foot of mount *Sinai*) break all the ten commandments at once; for ſingle diſobediences, if preſumptuous, may have the power to exile that fear of God, whoſe expulſion compriſes in it the whole trade of ſin, which (conſcience once deſpiſed) is known without being learnt. If a reverence to the commandment were that, which did place limits to the variety of your oaths, it would not permit the uſe of any one, but lay an equal reſtraint in relation to them all; ſince the ſinfulneſs of ſwearing does conſiſt, not in the diverſity of our oaths, but in their forbiddenneſs. But this excuſe itſelf is often wanting to many of our gallants, who not content with the received forms of diſhonouring their Maker's name, do as much affect novelty in their oaths, as in the faſhion; and if they have a gift of ſingularity in ſwearing, are as proud of it, as of their miſtreſs's favour: ſuch people are as nice as impious in their oaths, they will never uſe any till it be ſtale and threadbare, but (ever like their clothes) leave them off before they have been worn long enough to grow old. But whilſt they are thus induſtrious in the diſcovery of new ways of provoking their Creator, it is much to be feared, that they do but (if I may ſo ſpeak) find out for themſelves a north-weſt paſſage to damnation.

Exod. xxxii. 19.

PLEA VIII.

BUT, continues the ſwearer, if I ſwear not, I ſhall not be believed.

ANSW. But (it is replied again) belief is better wanted, than purchaſed at ſo dear a rate as ſin; ſince he, that parts with heaven, makes over a bad bargain, though the whole world were the accepted price. But alas! unleſs men will conſtrue their diſobediences for arguments of your obſequiouſneſs, how unlikely is it, that (by believing you ſpeak truth, becauſe you uſe to ſwear you do not lye) they ſhould take your readineſs to tranſgreſs one of God's commands, for a proof, that you dare not break another.

Matth. xvi. 26.

How ridiculous would men eſteem that merchant, that ſhould be confident to gain credit amongſt lenders, by giving bond for every trivial ſum, for which others are truſted upon their bare word? For in oaths (as in

moſt other things) too conſtant a frequency depreciates that authority, which their rareneſs, as well as nature, gives them; that not being held a ſufficient ſecurity for the belief of a doubted or important truth, that is laviſhed to authoriſe every trivial and impertinent aſſertion; nor thought a convincing atteſtation of a queſtioned truth, that flows rather from a cuſtom of ſinning, than deſign of confirming. No, no; he needs not many oaths, that uſes few; for to be known to make a conſcience of an oath will gain your words more credit than the ſwearing of a thouſand; it being a viſible and remarkable judgment of the offended Deity upon oaths, that their number diſcredits that truth itſelf would perſuade.

SINCE then it is your habitude of ſwearing needleſsly, that alone engages you to a neceſſity (as you call it) of ſwearing to be believed, let your diſcontinuance remove that obligation cuſtom only has contracted; and believe me, that the moſt perſuading aſſeveration of all is ſo to live, as not to need to ſwear. That ſociableneſs, which you allege to extenuate your fault, but aggravates the heinouſneſs of the crime, by confeſſing cuſtomary oaths to be like jealous tyrants, whom we cannot entertain, without giving admittance to their retinue and their guard, ſince in this vice you acknowledge the act an engagement to a repetition; and that oaths, which are the ultimate and higheſt confirmations of truth in their nature, muſt yet (by this fine policy) themſelves derive an authority from their multitude; which is very unneceſſary, where the aſſertor is believed, and uſually does but create diſtruſts, where the veracity is not credited.

Heb. vi. 16.

PLEA IX.

OF kin to this is their apology, who plead, that if they do not ſwear, their words ſhall neither be feared nor obeyed by their very ſervants; men's ears being of late ſo accuſtomed unto oaths, that they are neceſſary to make them think we are in earneſt. This is the uſual objection of the French, amongſt whom this vice is grown ſo epidemical (as of blackneſs amongſt the Ethiopians) its commonneſs has removed all the deformities they would otherwiſe find in it.

ANSW. But ſure there are ways enough to make your ſervants obey your commands, without your breaking God's. Gravity and ſeverity, not uſing them to hear you ſwear, are courſes likelier far than oaths to reach that end; which if they yet ſhould fail of, they would turn this fancied inconvenience into an advantage of neceſſitating you to the election of religious ſervants. Certainly, ſince the ſole univerſality of vice has drawn upon us this ſuppoſed neceſſity, a general and unanimous deſertion of it muſt needs be the propereſt expedient for its removal. And, believe me, it is but an extravagant way of teaching our inferiors to pay us their duties, to teach them to diſobey the commands of their ſuperiors by our own example, and to lead them the way to deſpiſe the injunctions of the moſt adored powers, to whom we confeſs to owe an exquiſite obedience, upon the higheſt conſiderations.

BUT admitting (as the diſperſedneſs of this vice too often forces us) the ſuppoſal of this plea to be true, yet will the inference prove conſequent? For by the ſame reaſon the thief might juſtify the unreclaimedneſs in his robberies, by alledging, if he forſake that trade, his purſe muſt ſoon grow empty; or the Buona Roba excuſe her proſtitutions, by ſaying, that unleſs ſhe continue her former profeſſion of wantonneſs, ſhe ſhall no more be preſented with new gowns, and linen richly laced, nor be able any longer to maintain her wonted riots; her converſion (by forbidding her to be the cheriſher of her gallants looſe exceſſes) depriving her of the only fuel of her bravery. Upon how few could we with juſtice preſs religious duties, if ſuch petty inconveniences attending their performance were a warrantable diſpenſation or diſengagement from it? Surely he, that requires, that we ſhould "pull out our right eyes, and cut "off our right hands," if they oppoſe our entrance in at the ſtreight gate, will ſcarce give them admittance, that will not purchaſe it by the parting with ſuch trivial conveniencies. It is much leſs unreaſonable, that you ſhould be neither believed nor obeyed with readineſs, than that God ſhould either not be believed when he ſpeaks, or not obeyed when he commands. For take this for a truth, to which oracles are fables, that never any man commits a ſin to ſhun an inconveniency, but one way or other, ſoon or late, he plunges himſelf by that act into a far worſe inconveniency, than that he would decline.

Matt. v. 29, 30.

PLEA X.

OTHERS there are, that uſe to repreſent, that they ſwear not but when they are angry; and then (for all our clamours and exaggerations) they mean no harm at all.

ANSW. But would you take it for a juſtification of your wife's adulteries, if ſhe ſhould tell you, that ſhe never proſtitutes herſelf, but when her fits of luſt tempt her to give that ſatisfaction to her appetite? Beſides, this is but to excuſe one fault with another; and with no greater juſtice, than his, that ſhould defend a baſtard's crimes, by alledging, that his mother was a whore; ſince the nature, as well as the duty of virtue, being the moderation of our paſſions, it is evident, that their exceſſes degenerate into ſins; and therefore how that can be a good excuſe, that needs one, and how that anger, which in itſelf is ſinful, can impart an innocence to productions in their own nature culpable, let thoſe that are concerned determine.

FOR my part, when I conſider the apoſtle's command, "Be ye angry, and ſin not;" I cannot but apprehend, that when our paſſions ſwell into exceſs, they are indeed contaminated by the guiltineſs of their productions,

Eph. iv. 26.

tions; but confer not upon them a meritoriouſneſs, which themſelves want. But why, I pray, in every paſſionate mood, muſt you be tranſported to commit ſins, that are as unprofitable as impious; and to deſerve your croſſes, by a ſaucy provocation of your God, whom you then endeavour to make your enemy, when you muſt need his favour to protect you from diſquiets? Why muſt your tongue fly in your Maker's face, and vilify his ſacred name, becauſe your dice turn up ſize-ace rather than quatre-trey? For either he is the guider of thoſe ſeeming chances, or meddles not with their diſpoſal: in this laſt caſe you are palpably injurious, to make God the object of your choler, when he is not the cauſe of it; and in the former caſe your folly is not inferior, inſtead of propitiating, to incenſe that Deity, who is the ſole diſpoſer of thoſe fortunes we either wiſh or fear.

But take heed he give you not too much pretence to be ſo, by diſpleaſing you, (as diſcreet mothers whip their froward children, that cry without cauſe) and puniſh in his anger theſe raſh and culpable expreſſions of yours. As for the other branch of the excuſe, I mean the harmleſſneſs of your intent; to that I muſt reply, that our actions may as well offend as our intents, if they be ſubſequent to our knowledge of God's averſion to what we do. And uſually men take it for a ſufficient offence, to do what we are ſure will diſoblige them, though with a differing deſign. Nor do we think ourſelves leſs injured by robbers when they ſtrip us, becauſe they offer us that violence, not with intent to anger us, but only to make a booty of our purſes. It is a received maxim in divinity, which moraliſts prop with their full concurrence, that no goodneſs (much leſs bare innocence) of the intent can juſtify a formal ſinful evil. If then the committing of this ſin againſt the knowledge of the ill you act, be not crime enough to condemn you, you muſt not be denied my abſolution. But withal, I muſt acquit moſt ſinners in the world upon the ſelf-ſame ſcore; and believe the threatned flames of hell as uninhabited as inſupportable; ſince certainly ſuch ſinners (if any ſuch there be) muſt be prodigious no leſs for their unequalled rarity, than deviliſh perverſeneſs, that are ſuch monſters as to offend their Maker, merely to offend him. For in philoſophy our maſters teach us, that ill under that notion cannot be the object of our choice; (that being ever a real, or at leaſt a ſeeming good;) and though in our miſguided elections we oftentimes embrace it, yet that is ever under a contrary notion, and rather by miſtake than by deſign.

But oh! how induſtrious are ſinners to deceive themſelves; and how ſtrangely does the devil faſcinate and blind deluded mortals, when (by ſuch ſilly and impertinent excuſes) he perſuades them rather to expoſe their judgments to a certain diſcredit, than let their ſouls be ranſomed from an ignoble ſlavery, into a glorious freedom; and rather ſuffer their abilities to be believed weak, than permit their lives to be made virtuous. Certainly, ſuch people would make me as much aſtoniſhed as themſelves are faulty, if I did not conſider this gallant property, of rather making bad apologies to defend their ſins, than good reſolutions to forſake them, as entailed upon them by a kind of traduction from our firſt parents, who hoped with fig-leave aprons, and the faint ſhade of trees, to hide both their nakedneſs and their diſobedience from the omniſcient eye of God himſelf.

I will not waſte ink upon their ſucceſsleſs and impudent defence, that make their drunkenneſs an apology for their ſwearing, and make that an excuſe for their ſin, which is itſelf a ſin above excuſe; but with as little juſtice, as the keeper of the lions in the *Tower* could excuſe any particular tragedy they had acted, by alledging, that he had voluntarily let them looſe. But ſince the tempers, that moſt diſpoſe men to a flux of oaths, are drunkenneſs and choler, give me leave, by the by, to take notice of the chief midwives, that are uſually aſſiſtant to the birth of oaths; and to obſerve, that as the thunder falls not, but when heaven is overcaſt, ſo we are proneſt to ſwear, when the beaſtlineſs of our paſſions hath either blinded or depoſed our reaſon.

PLEA XI.

It is confeſt, you may allege, that ſwearing is a moſt heinous ſin, but I do never ſwear myſelf, but only to repeat thoſe oaths of another (which are therefore his ſins, not mine) whoſe omiſſion would ſpoil the jeſt.

Answ. This brings into my mind the known ſtory of that merry gentleman, who to ſhew the ſullen juſtice, how the maſtiff he had killed had firſt aſſaulted him and overthrown him, runs full but at the formal Sir's breaſt, and ſends both him and his chair to ſalute the ground: for when a ſin cannot be imitated, without being committed, then that you but repeat it only, is as ſorry an excuſe, as his muſt be, who, to illuſtrate the relation of a murder, ſhould piſtol the firſt man he meets withal. Beſides, when did tranſgreſſion by precedent turn innocence? and what was unlawful in the act, become legitimate in the repetition? It is acknowledged, that the relating of another's oaths may ſometimes be not only lawful but neceſſary; but then it muſt be either to diſcover or convert the ſwearer; or elſe when the oath is ſome material circumſtance of a ſerious narrative. But here the very end adds guiltineſs to the action, it being only to make another's vice applauded, and render his ſin both infectious and immortal. But how will you juſtify this introducing of God's name only (like a fool in a play) to make the company laugh, and to bring it into contempt, from the diſobedience to the prohibition of taking God's name in vain? Unleſs (perhaps) the conſequences of your ſin teach you a conſtruction, that may reſolve this difficulty; and the judgments your ſwearing will produce, ſhew you, in what ſenſe you have taken your Maker's

name in vain. Remember how ſad a reckoning was preſented to *Belſhazzar* by the hand-writing upon the wall, for having turned the veſſels of the temple into implements and furtherers of mirth, at his ſumptuous entertainment; and conſider betimes, that God may leſs reſent the making merry in his holy cups, than the making merry with his moſt holy name.

To this may well be added, that in this ſinning at the ſecond hand, the copied ſin is held more criminal in the tranſcript than in the original; for beſides that this ſwearer by imitation acknowledges himſelf ſo delighted with the other's ſin, that he becomes the devil's mountebank (or his zany) to have it admired by all, that hear him, (and we know, that approbation is but an after-conſent;) beſides this, I ſay, the leading ſwearer has the excuſe of an immediate applauſe; whereas the apiſh repeater wrongs and diſcredits his own piety, only to celebrate and proclaim another's wit; if that be not too partially termed wit, that appears ſuch only to our corruptions; ſince when the oath muſt make the jeſt, it is only the devil in us, that is pleaſed with it. Handſom replies are good without oaths, and dull ones will not be made good by them: to the one they are needleſs, to the other they are uſeleſs; that being juſtly enough appliable to oaths in apophthegms, which is uſually believed in painting of faces, that beauties need it not, and deformed women look but ridiculouſly for it.

Prov. xiv. 9. Fools (ſays the wiſe man) "make a mock "of ſin;" they can take pleaſure to hear him affronted, in whoſe communion conſiſts happineſs; and make that the fuel of their jollity, that ſhould be the object of their deteſtation. For my part, I do not like this doing in jeſt, what a man may be damned for in earneſt; and I much wonder, that we frail mortals, whoſe faults are more numerous than the very minutes we have lived, ſhould think our own ſins too few to condemn us, without adopting thoſe of others too! And to our crimes (too numerous already) adding theſe ſins of ſupererogation! But to reſume our theme.

PLEA XII.

There remains yet a prejudice to remove, which, though very rarely the pretence of ſwearers, is very often a prevalent motive to ſwearing, and is an evil by ſo much the more obſtructive to theſe ſinners reclaiming, by how much the more ſilently it oppoſes it. This is a fooliſh fancy, that many ſwearers cheriſh, that their oaths make them looked upon with a kind of admiration, as gentleman-like ſins; and witneſs in them ſo bold and daring a courage, that it extends to a fearleſſneſs of God himſelf.

Answ. But though their bluſhing to own ſo childiſh a pretence be a ſufficient diſproval of it; yet ſince as in war, ſo in diſputes, we conſider not ſo much the perſonal ſtrength of the adverſary we attempt, as the rank he holds among thoſe, that employ him; it will not be amiſs to remove an obſtacle, made conſiderable by being ſo great a vice's motive, and ſo great a motive to that vice: though of this ſort of ſwearers (as of ſome ſavages, that lurk in rocks and woods) it be much more difficult to obtain a battle, than to get a victory; and to draw them to the field, than to give them a defeat.

Doubtless theſe needy gentlemen will never tempt the admiration of wiſe men upon any other ſcore, than that of the greatneſs of their folly. They muſt be thought ſtrangely neceſſitous of meriting qualities, that do ſo meanly by their bad ones implore and court men's good opinion: and I know not, whether be the greater, their impudence to expect it for the recompence of vice, or their profuſeneſs, that ſhould ſquander it away on thoſe, who have no juſter title to our eſteem, than that, by which the miſerableſt of beggars pretend to our charity, the multitude of their imperfections and wants. Wiſe men will make theſe poor and empty projects the objects ſolely of their ſcorn and laughter; and only thoſe, that want eſteem for themſelves, will reward you with it; and for ſuch people's praiſes, they will but diſcommend you: ſo that that empty applauſe, you are ambitious of, will either be impoſſible to be purchaſed, or not deſerve to be purſued. But what, your oaths will make men take you for a gentleman! You are deceived, there is too little Epicuriſm and chargeableneſs in your vice, to be affected to that quality. It was ſtill ſo cheap, and now grown ſo common, that I wonder our grandees, though they deſiſt not for the ſin's ſake, renounce it not, at leaſt for the company's. Muſt then vices be arguments of the poſſeſſion of that dignity, that virtue is the ſole true means to purchaſe? I am ſure it ſhould not be ſo; but grant it were, will you pretend to nobility, by that alone, which is not the property, but the vice of gentlemen? and entitle yourſelf to that illuſtrious quality, by that, which, in God's eye, makes them unworthy, if not diveſts them, of it? At that rate your pretenſions would parallel his mirth, who boaſted a deſcent from the firſt *Cæſars*, barely upon his being (like moſt of them) almoſt deformedly hawk-noſed, deriving his intereſt in their blood, only from his ſympathy with their defects.

For my part, I muſt confeſs, I am not ambitious of thoſe badges of gentility, that Chriſtianity delivers for the ſymptoms of reprobation; nor do I find men deſirous of the gout, though the proverb have appropriated that diſeaſe to rich men.

But then (you think) your courage will be unqueſtionable: and indeed it may ſeem, that you want not probability to prop up your hopes, ſince you deſperately hazard the incurring of immortal torments, for that, for which no wiſe man would venture the ſtretching of his little finger. But ſince the kindred betwixt virtues is not ſo remote, that the want of any one ſhould conclude the poſ-

ſeſſion of any other, and your impiety convince us of your courage; experience teaches us, that no men more fear what they ſhould contemn, than thoſe, that contemn moſt what they ſhould fear. And martyrs have embraced thoſe flames with joy, that impious perſons durſt not ſo much as think of without horror.

THAT boldneſs, that men perſonate againſt their Maker (were it real) would not be the effect of their reſolution, but either of their inconſiderateneſs, or their unbelief. "The "wicked flee (ſays Solomon) when no man "purſueth; but the righteous are bold as a "lion." And indeed it is no great encouragement to deſpiſe this life, to want either hope, or at leaſt confidence of a better. Nor will all men ſo eaſily conclude, that he, that fears not to venture his ſoul, dares freely venture his body. For ſince it is not the eſſential worth of things, but the proprietary's value of them, that their dearneſs to us is to be meaſured by; that ſtandard, and moſt men's actions, will preſent us the ſoul and body in a very inverted order of precedency; the greater part of men living for the body, as if they were all body, and ſlighting their ſouls, as if they had no ſouls, or had them but to loſe. It being but too true of the very greateſt of thoſe people, that in themſelves, as in their ſtables, the employment of the man is but to ſerve the beaſt. And truly he, that conſiders, that the neglect of the ſoul proceeds from the former dotage on the body, will think, that a very unlikely conſequence, that infers a readineſs to hazard the latter, from the careleſſneſs of what becomes of the former. He, that ſhakes off the emboldening fear of God, betrays himſelf to as numerous apprehenſions, as did the weak-eyed frantick, who, to be ſecured from the offenſiveneſs of the ſun's brighter beams, by pulling out his eyes, expoſed himſelf to all thoſe dangers, and thoſe horrors, that attend on blindneſs.

Prov. xxviii. 1.

PLEA XIII.

BUT, ſay ſome ſwearers, if I renounce this vice, my repentance will procure me a deriſion I ſhall be aſhamed of.

ANSW. Muſt then that baſhfulneſs, which is both the livery and guard of virtue, oppoſe our addreſſes to it? Like ditches, when the drawbridge is cut down; which, though their uſe be to ſecure the fortreſs from enemies, forbid acceſs to them, that once have ſallyed, when they are meditating a retreat. But yours is an excuſe as receivable as the whores, who pretended baſhfulneſs for their turning honeſt. I was much taken with an Italian gentleman, who ſpying a friend of his peep out his head from behind the door of a Bordello, to ſee, if he might retire undiſcovered; "Come forth, come forth, cries he; "you need not be aſhamed to leave that ſlut-"tiſh place; but you ſhould have been a-"ſhamed to have entered it."

HAVE innocence and vice then ſo changed natures, that he, that did not bluſh to commit ſin, ſhould bluſh to forſake it? And he, that hath once framed miſhapen characters, be aſhamed afterwards to write a neater hand? The bluſhes, that do wait on our repentance, proceed from an implicit confeſſion it imports of ſome former faultineſs; and ſo if it have been ſhameful to have committed a fault, how much more ſhould we be aſhamed to continue, and how little can it diſcredit us to forſake it? And truly, he, that thinks a fault a juſt engagement to a relapſe, leſt his converſion ſhould make him laughed at, deſerves the cenſure men would paſs upon that fool, who having ſlipt one foot into a quagmire, ſhould rather proceed to be entirely bogged, than by timely ſtepping back, to confeſs a miſchance, that may provoke men's laughter. I had much rather men ſhould laugh at my retracting, than God frown upon my relapſes; and care not ſo much, who ſmiles at any action, that makes my conſcience do ſo, (not by way of deriſion, but of applauſe.)

How contradicting are the deſires of mortals! We are angry, if we are not thought virtuous, and yet we are aſhamed to appear ſo, and think it a juſt ground of quarrel, to be reported the contrary of what we bluſh to ſeem! Like ladies, who though they long to live till they grow old, fret to appear what they deſire to be. The ſinner, that is overmuch concerned in bad men's opinions of good mens actions, does as it were ſwear allegiance to the devil, and let him bore his ear through with an awl againſt the door-poſt, ſealing an engagement to perpetual bondage; for (as the ſame men that crucified our Saviour, derided him) as long as the greateſt part of men are wicked enough to injure piety, there will be found men impudent enough to mock it.

Exod. xxi. 6.

FOR ſinners knowing, that in the world's eſteem, the extent of a deformity makes it vaniſh, and that the generality of a crime does ſo diveſt it of that name, that every body's ſins are thought no body's, are by the cheapneſs of the expedient eaſily ſwayed to intruſt the protection of their reputation rather to common guilt, than to a private virtue; and to ſeek an innocence rather by adding to the number of the wicked, by their calumnies and deriſion, than by increaſing the number of the godly by their converſion. Thus being bribed by their own intereſts to diſcredit ſuch actions, as they are tied to, and yet will not practiſe; it is no wonder, if by ſcoffingly condemning what cloſely condemns them (though therein their conſciences give their tongues the lie) they cunningly endeavour to father their faults, not upon their want of piety, but ſtore of wit; and to make their ſlavery to their paſſions paſs for the ſuperiority of their judgments.

BUT ſure he is very unfit to be Chriſt's ſoldier, that bluſhes to wear his heavenly leader's colours, and wants the courage to diſobey example. He, that will take the *Canaan* above by violence, muſt imitate the conqueror of the *Canaan* below, who profeſt to

Joſh. xxiv. 15. to the world, "If it ſeem evil unto you to "ſerve the Lord, chuſe you this day whom "you will ſerve, whether the gods, *&c.* But "as for me and my houſe, we will ſerve the Matt. v. 11. "Lord." Our Saviour (who for us "endured the croſs, deſpiſing the ſhame") apportions felicity to the being reviled for his ſake: and congruouſly his apoſtles being Acts v. 14. cauſleſly miſuſed by the chief-prieſts, "departed from the preſence of the council, "rejoicing, that they were counted worthy "to endure ſhame for his name." Deriſion for virtue is a grievance as old as Job; who Job xii. 4. in his time complained, that "the juſt and "upright man is laughed to ſcorn:" and it was even Chriſt's own caſe; of whom one of the evangeliſts in ſome place records, that Matt. ix. 23. "they laughed him to ſcorn." But we may ſay of the reſolute Chriſtian, what the wiſe Prov. iii. 34. man ſays of his Maker, that he "ſcorneth the "ſcorners:" and ſurely, ſince God is ſaid to laugh divers tranſgreſſors of his law to ſcorn, it is not improbable, that he will not fail to laugh them to ſcorn, that for his glory ſcorn not to be laughed at: eſpecially, ſince ſuch perſons are deeply acceſſary to their own and piety's diſgrace, by a ſneakingneſs, which ſo implies a guilt, that where it proceeds not from a fault, it is one: and themſelves highly countenance the diſcountenancers of the profeſſion of religion, by being aſhamed to own it. Whereas the loſs of the blind world's applauſe ſhould prove as little diſſuaſive in the point of converſion, as its acquiſition ſhould be a motive. The man, that dares be good without a precedent, looks like the nobleſt precedent of good: though, to ſay truth, as horſes are not much prized, only for not refuſing to ſet forth, unleſs others lead the way, and for not leaving the track they once are in, becauſe none but reſty horſes are guilty of the contrary faults; ſo is not the gallantry of contemning the opinions and ſmiles of ſinners ſo meritorious as it is thought; ſince none but children (and they too laughed at for it) will let themſelves be frighted from what they love, by others making mouths and faces at it. Could ſingularity in goodneſs conſiſt with the innocence of others, a gallant ſpirit would look upon that ſolitude rather as a delight than a determent; ſince it is not a greater affliction to his charity, than it is a compliment to his generoſity, by aſſuring his devotion of the higheſt extraction, and reſtraining the acts of it to the nobleſt ends.

He is the welcomeſt to paradiſe, who ventures though alone, and comes unattended thither; I mean, who by ſo reſolute a bravery, as ſetting forward to heaven, without ſtaying for company, gives ſo good example, that he arrives there with much difficulty. To all this I muſt add, that when once it is noted, that the apprehenſion of being derided for retracting is the ſole obſtacle, that ſtands between your reaſon and ſo important a change as your converſion, they will juſtly eſteem your parvanimity ſo great, that you deſerve deriſion for ſo poorly fearing it; and ſo you will fall into that contempt you would decline, by your very ſhunning of it. If then laughter in this caſe cannot abſolutely on both ſides be avoided, ſure it is much better to endure that of fools at your repentance, than that of wiſe men at your timorouſneſs. Did not martyrs, through frowns, infamy, and torments, force themſelves a paſſage to the ſame heaven you aim at; and will you with ſmiles be frighted from your happineſs? I am aſhamed of it; and if you be not ſo of yourſelf, Chriſt will be ſo of you: for, "Whoſoever (ſays our Saviour, who before Pontius Pilate witneſſed a good confeſſion) "ſhall be aſhamed of me, and "of my words, in this adulterous and ſinful "generation, of him alſo ſhall the Son of "man be aſhamed, when he cometh in the "glory of his Father, with the holy angels." And truly, for my part, I had rather be laughed at by men on earth, than howl with the devils in hell. Mark viii. 33.

DIGRESSION.

[* Nor need we be (as even the beſt new converts often are) ſo ſcrupulous to own repentance, for fear of injuring humility; ſince, certainly, if the latter be a virtue, ſhe cannot enjoin a vice ſo heinous as ingratitude, by forbidding us even ſuch a retribution as acknowledgment; for ſure it is the leaſt return we owe to God for his gifts, to confeſs, that we have received them. Who would not tax him of unthankfulneſs, that, being loaded with a prince's preſents, ſhould diſclaim them, for fear of confeſſing himſelf to be rich? Although a woman, praiſed for her complexion, be bound in modeſty to gainſay thoſe praiſes; yet if the fire have given her a good colour, it is not thought pride to refrain contradicting, becauſe the effect being natural to the fire, and requiring no excellent prediſpoſitions in the object, to refer thoſe aſcriptions to their cauſe, is held to juſtify the not rejecting them: ſo though there be an eye of vanity in the publication of thoſe graces, whoſe near reſemblance (or affinity) to virtues merely moral leaves their extraction dubious; yet true repentance is a grace ſo purely foreign, that being acted in us by a principle not native or acquired, but infuſed, to own the having received it, is not to boaſt our merits, but acknowledge our debts; the vanity being rather on the other ſide, who, by pretending to diſclaim ſo ſupernatural a grace, imply, that they eſteem it to be their own inheritance or purchaſe. God's goodneſs being ſo free, that it is the only title to its ſelf; and the motives of his favours being taken from himſelf, and not from us, his

* The lines included within this parentheſis [ ], may, perhaps, paſs for one, and appear ſomewhat foreign, both to the theme and ſtile of this diſcourſe: I have yet ventured to inſert them here, to pleaſe a perſon, that I much affect; leaving to the reader a liberty to ſkip them, if he pleaſe; but if he chance to vouchſafe them a peruſal, I muſt beg for them his attention; not that they deſerve it, but becauſe they need it. It ends p. 217.

bleſſings

bleſſings argue, indeed, the bounty of the benefactor, but infer not the merit of the obliged; ſince the ſpirit's irradiations into our ſouls (like the ſun's ſhining upon ſhrubs and hemlock) are due to the diffuſiveneſs of his goodneſs, not the attractiveneſs of ours. Moral virtues may perhaps be reſembled to great men's clothes, which ſupply thoſe, that ſee them, with ſome conjectures of the quality of thoſe, that wear them: but inſpired graces (ſuch as repentance is) are like their liveries, whoſe gaudineſs evinces not the footman's deſerts, but his lord's ſplendidneſs; and in men's eſteem entitles the lacquey to nothing but a good maſter. Thoſe better qualities blood may convey, or induſtry acquire, like honours conferred by princes, ſuppoſe the party deſerving; but heavenly donatives are like alms, which ever preſume need; and where they are more liberally beſtowed, ſtronglier conclude the greatneſs of the party's wants than merits.

Upon ſuch conſiderations poſſibly as theſe, the great apoſtle (after a recital of his firſt unworthineſs) ſcruples not to write of himſelf in ſuch bold terms as theſe; "By the "grace of God I am what I am, and his "grace, which was beſtowed on me, was not "in vain; but I laboured more abundantly "than they all," (meaning the college of the holy apoſtle's) "yet not I, but the grace of "God which was with me." I might produce many reſembling paſſages of ſcripture, had I not handled this ſubject elſewhere.) But truly, ſince you are commanded in the goſpel to "let your light ſo ſhine before "men, that they may ſee your good works, "and glorify your Father which is in heaven;" you ought to conſider, whether or no your expreſſing a ſerious diſlike of others preſent, and your own former practice (in point of ſwearing) do not either proclaim your repentance, or infer you a hypocrite. And if your reaſon (as queſtionleſs it will) lead you to embrace the affirmative, believe you are then farther to be put in mind, that not only the confeſſion of our virtues is juſtifiable, when it is neceſſary to your juſtification, but (though in all other caſes our actions ſhould commend us, not we ourſelves, praiſe being a debt, which he that pays himſelf, acquits all others of) even the mention of our own praiſes is allowable, when they are produced, not to extol, but barely to vindicate us, and finds a ſufficient defence in its being neceſſary unto ours.

1 Cor. xv. 10.

In an Eſſay of miſtaken Modeſty.

Mat. v. 16.

The owning of repentance has ſo much of penance in it, that there is not any grace more indiſpoſed to a perverſion into vanity; for ſtill repentance (like the pardon it endeavours to procure) does preſuppoſe a fault, having this particular unhappineſs above other virtues, that men cannot arrive at it but through vice. And therefore in the return to the diſintereſtedneſs of action, virtue (who can ſcarce more reward our love to her, than by imparting unto us a higher degree of it) commonly recompenſeth ſo unſelfiſh a duty, by making it a powerful engagement to perſeverance againſt relapſes; and any affront or loſs ſuſtained upon that ſcore turns to a bleſſing, by producing in us, towards religion, the uſual property of ſufferers for a cauſe, more zeal and paſſion for the party men have been ſufferers for. But admit you could not own repentance without being fancied vain, muſt the fear of others ſins continue (thoſe that are immediately) yours? Will you rather let others ſin by imitation of your bad actions, than in their miſconſtruction of your good ones? And will you quench the ſpirit, and refrain from being virtuous, leſt men ſhould think you know yourſelf to be ſo? Eſpecially ſince our ignorance in good performances, though it criminate the act, degrades the agent from the title of virtuous; virtue being a habitude elective, and election pre-requiring knowledge. Which reaſon I might fortify, by aſking to what end preachers ſhould light us ſo many candles, and give us ſo many touchſtones to diſcover and examine graces with, if our being conſcious to our own repentance were a fault that deſerved it? Undoubtedly, that were (and that were ſtrange) to make it our duty to ſeek, what it were our ſin to find.

This laſt reflection I muſt recruit, by adding, that ſince our improvement of, and thankfulneſs for grace, will be expected proportionable to our ſtock of it, (as the parable of the talents, and our Saviour's declaring, that "where much is given, there alſo much "will be required," evinces) we cannot without the knowledge of our receipts, know what our returns muſt be (of gratitude and duty) to be anſwerable to them. The utmoſt, that modeſty does exact of you, is the declining of thoſe praiſes your actions do deſerve, not the refraining actions, that deſerve praiſe, for fear of being ſuſpected to affect it. But truly baſhfulneſs, though in maids thought a virtue, in virtue is a fault; for ſure it is one of the worſt compliments you can put upon the ſpirit, to lock him up in a dungeon, for ſhame to own his viſits.

The union betwixt virtues is too ſtrict, and their aſſiſtances reciprocal, that that may be concluded to be no virtue, that forbids the exerciſe of any, and does not rather facilitate than obſtruct it. Certainly it is better be accuſed of vanity, than guilty of relapſes; and if ſome reputation muſt be loſt, it is fitter that you ſhould be diſhonoured by other men's faults, than God by yours; for he is good enough to recompenſe his ſervants, not only for being good, but for their not being thought ſo for his ſake; and to make one day their diſhonour (not only the foil, but) the purchaſe of their glory. I have ſpent the more ink to carry away this obſtruction, becauſe I have obſerved it to be a block, at which the beſt natured novices in piety are the moſt prone to ſtumble; the devil, our ſubtle antagoniſt, (more ſerpent far than that he tempted our firſt parents in, when he inſinuated himſelf into our credulous mother's eaſy faith; in which ſly winding creature, he elected not a fitter inſtrument than emblem) in the ſcruple

have laboured to remove, leaving his own to aſſume the borrowed habit of an angel of light; in that diſguiſe to make virtue claſh with grace, and pervert modeſty into an obſtacle of reformation. Thus when man was once fallen from paradiſe, even cherubims intercepted his return unto the Tree of Life.] Gen. iii. 14.

The laſt Excuſe.

LASTLY, (replies the ſwearer) all this I confeſs to be very true; but what would you have me to do? Long time and cuſtom have ſo habituated me to this vice, that I find the impoſſibility of my ſubduing it as great as my willingneſs to leave it.

ANSW. Well, I am very glad we have brought you to this paſs: it is then confeſſedly a ſin, and a great one: the queſtion therefore is, whether it be fitter for God to make it no ſin, or you not to make it yours; and for him to be reconciled to the evil of its nature, or for you to deſiſt from its practice? Your apology is juſt as excuſing as the murderers would be, who ſhould alledge before his judge, that ſince he had been a murderer from his youth, he begs to be excuſed; but truly for his part he could not help it, and he muſts need continue the trade of cutting of throats, that he had ſo long practiſed. Is not yours a holy conſequence, I have been wicked long, therefore I will continue ſo ſtill? Sure it is the devil's logick, from thoſe ſins, that evidence the juſtice of our ſuddener repentance, to infer the legitimateneſs of our relapſes into crimes. The argument would have as much reaſon, and more honeſty, that concludes out of, I have been wicked but too long already, that therefore I muſt be ſo no more; and from our former want of piety, infers there needs a greater meaſure now to make amends for paſt omiſſions. You would judge him uncharitable, that ſhould tell you, that you are ſcarce ſo much as deſirous to be forgiven: but (to ſhew you how little you have for your opinion, beſides your wiſhes) conſider who would think that delinquent very ambitious of pardon, who refuſes to accept it, unleſs he may have licenſe to thieve again; and declines to purchaſe it by an engagement againſt former miſdemeanors. Certainly,

Weak is th' excuſe, that is on cuſtom built;
For th' uſe of ſinning leſſens not the guilt.

AND cuſtom in evil rather increaſes than contracts the fault; for that cuſtom, that now is the parent, was firſt the child of ſin, ſince the evil of cuſtom proceeds from the cuſtom of evil; (like ice, which though it eaſily thaw into water, was firſt produced out of that element's congelation.) And therefore our equitable and impartial laws, that in theft chaſtiſe the firſt faults only with a brand upon the hand or ſhoulder, puniſh relapſes with deſerved death.

NOR are the obſtacles, that oppoſe your cure, ſo ſtubborn as you are pleaſed to fancy them. We flatter ourſelves in augmenting the difficulty of our repentance, that we may leſſen the guilt of our neglects. The truth of it is, our baſeneſs adds dimenſions to theſe difficulties, becauſe we are really loth to forſake our ſins; and yet would fain cheat our conſciences into a belief, that our refractorineſs and impenitency do proceed, not from our unwillingneſs to mend, but from our impotence. We do not, in this caſe, like many flouriſhing orators, who out of oſtentation uſe to create monſters, afterwards to quell them; but like children in the dark, who fancy firſt horrid miſhapen bug-bears, and then are frighted by them.

AND yet when the ſlight penalty of a ſhilling is laid upon each oath, and ſtrictly exacted, we may eaſily diſcern a viſible abatement in the tale of your ſins, as long as you are true to your engagement; which were not moſt men too ſoon weary of would (probably) ſoon make them weary of offences of that nature.

IT is the opinion both of pious and of judicious perſons, that ſwearing is therefore, though not the moſt unpardonable, at leaſt the moſt inexcuſable of vices, becauſe that in it men have moſt power to refrain: and in effect this ſin is ſo deſtitute both of temptations, advantages, and apologies, that in ſubduing the cuſtom of ſwearing, we have ſcarce any thing but the cuſtom to ſubdue. Try; it is leſs eaſy to ſurmount the belief of the difficulty, than the difficulty itſelf, which nothing makes ſo much invincible, as our thinking that it is ſo.

HERE, a willingneſs to hoiſt ſail (to quit this ruinous vice) ſerves for a proſperous gale. If therefore Chriſt, by giving you a deſire to ſhake off the clogging yoke of ſin, do call you to himſelf, give me leave to ſay to you, as the people did to the blind man of *Jericho*, "Be of good comfort, riſe, he calleth thee." Mark x. 49. And to complete that comfort, I muſt tell you, that the operation of ſaving grace upon the ſickneſſes of the ſoul is like that of the pool of *Bethesda* upon the infirmities of the body; ſince without all regard either to the age or greatneſs of the diſeaſe, ſo the remedy be but duly applied, the cure is infallible. John v. 2, 3, 4.

I SHALL never deſpair of the recovery of any, that is but heartily deſirous to be reclaimed; ſince that, which God was pleaſed to make me lately inſtrumental to work upon a gentleman, whoſe nation being French, his vice little younger than himſelf, humour extremely cholerick, and his apprehenſions of the ſucceſſleſſneſs of his endeavours very great, obliged him to vanquiſh indiſpoſitions numerous and great enough to make that concurrence very frequent in one ſingle perſon; and yet before one fortnight was effluxed, he obtained ſo viſible a conqueſt over this ſtubborn vice, that he had afterwards only as many relicks of it to ſuppreſs, as might keep him from growing proud of ſo ſudden a recovery.

SO eaſy is it after having vanquiſhed the imagination of the difficulty, to overcome the

difficult itſelf; for in matter of uneaſy Chriſtian duties, we muſt not only conſider the diſproportion of our weakneſſes to the obſtacles we muſt ſurmount, but allow the diſproportion of thoſe obſtacles, to the ſupernatural aſſiſtances we ought to hope for. For God requires nothing at our hands, which his own favour (zealouſly implored by our addreſſes) will not enable us to execute. And in this, the commands of God, differ from thoſe of men, that the latter but lay on us an obligation; the former inveſt us with a power to obey them. As when our Saviour commanded the ſick man (in the goſpel) to "take up "his bed, and walk," at the ſame inſtant he ſtrengthens his ſinews to perform what he enjoined: and in the firſt creation, that powerful command, "Let there be light," gave that bright creature an exiſtence, to make it capable of paying him an obedience. Let not then taſks above the forces of our nature diſanimate thoſe, that may expect aſſiſtances from his Almightineſs, who in the ſame leaves, where he commands us to perform more than we are able, promiſes to do in us what he commands; ſince difficulties are not eſſential properties of obſtacles, but only diſproportions to the powers they are to reſiſt. But admit that your habitude of ſwearing have rendered your converſion as difficult as you pretend; ſure then that, which cuſtom of ſinning has confeſſedly made ſo uneaſy, the continuance of that cuſtom is very unlikely to facilitate: as probably may he, whom a ſurfeit of melons has caſt into a fever, hope for a cure by eating more again. No, no; remember, that bad cuſtoms, like conſumptions, admit of remedies in the beginning, but grow ſtill more incurable by delay; and vices, like young trees, the longer they are let grow, the greater difficulty there is in felling of them; each ſingle ſin being not bad only for the evil of the act, but the propenſity it gives to repetition.

Mark ii. 9, 12.

Gen. i. 3.

SECT. II.

BUT becauſe to ſhew a ſinner the danger of his diſeaſe, without preſcribing him the remedies, that may contribute to his recovery, would be but to give him a perfecter knowledge of his wretchedneſs, and prove a truth as uncomfortable to him, as an ignis fatuus to the benighted traveller, that has loſt his way, whoſe horrid light ſerves not to guide, but to affright the wanderer; I think it not amiſs in the enſuing directions to caſt the ſwearer a few cords, by which (if they be carefully laid hold on) he may happily be drawn out of that deep and dangerous pit of ſin, into which his negligence or his corruptions may have betrayed him. Nor let the coarſeneſs of theſe home-ſpun lines divert you from making them inſtruments of your reſcue; for ſilk and ſattin ribbons, you know, are not ſo proper to draw men out of pits, as homely hempen cords: nor did the impriſoned prophet refuſe to be drawn up out of the dungeon, though by the help of "old caſt "clouts and rags:" ſince in caſes of this nature, it is not the value nor the fineneſs of the inſtrument, but their fitneſs for our purpoſes, that we ought chiefly to regard. But to begin without more circumſtance.

Jer. xxviii. 11, 12, 13.

DIRECT. I.

MY firſt advice ſhall be, ſeriouſly to conſider, that ſwearing is a ſin, and ſuch a ſin too, as not its nature, but its commonneſs only, makes men count little: for if we may judge of the greatneſs of the crime, by that of the vengeance heaven inflicteth on it, certainly God has divers times ſo ſeverely puniſhed obdurate and incorrigible ſwearers, that were his judgments on them as divulged as they have been terrible, that crying ſin would (poſſibly) be almoſt as unfrequent as it ought to be. Nor will the ſeeming harmleſsneſs of that act do more than make a parallel betwixt your fate, and that fond wretches (mentioned in the book of *Numbers*) that provoked ſtoning, for gathering a few ſticks on the ſabbath-day. For though Almighty God, (whoſe will is the exacteſt rule of good and ill) ſhould forbid actions otherwiſe innocent, yet his prohibition diveſts them from that property; and (as the preceding verſes of that paſſage alledged of *Numbers* intimate) makes you liable to a juſt puniſhment, though not for the act, yet for the diſobedience. And conſonantly we find, that though the killing of ſo horrid and parricidicial a murderer as *Cain* might ſeem an act of juſtice, yet God by his prohibition having rendered it a ſin, annexes a ſeven-fold vengeance to the breach of that command.

Numb. xv. 32.

Gen. iv. 15.

NAY, though the rebuilding of a ruined city be in itſelf not only innocent, but highly conducing to the publick good; yet God (to ſhew the independency of his juſtice, having forbidden the re-edification of *Jericho*'s raiſed walls, puniſhed the tranſgreſſion of that prophetick order, in the very children of the tranſgreſſor. An example of ſeverity very obſervable, being not, that I know of, to be parallelled. Conſider not therefore ſo much (in your ſwearing) the little harm you do, as the great God you offend. Falſe coinage is as well felony in farthings, as in half crowns, or twenty ſhilling-pieces, And as careful mothers ſoundlier whip their children for eating four crabs, and ſuch green traſh, than ripe and goodly fruit; ſo often are thoſe ſins moſt ſeverely dealt with, which bring us leaſt advantage; nor is it a prodigy, to ſee men get moſt ſtripes for thoſe offences they get leaſt by.

Joſh. vi. 26.

1 Kings xvi. 34.

IT is an eaſy matter in trivial things to tranſgreſs heinouſly. What trifle could appear ſlighter than the eating of an apple? Yet this petty ſeeming peccadillo loſt *Adam* paradiſe, and us a title to it; God's interdict enabling the core of that forbidden fruit to choak his immortality, and his poſterity's hopes of it upon earth. But I purpoſely decline all inſtances of this nature, not only in purſuance of my intended brevity, but be-

cauſe it is much nobler, and more handſom for you, to owe your repentance to your reaſon, than to your apprehenſion.

DIRECT. II.

In the next place, I ſhall preſcribe, a zealous and inceſſant ſolicitation at the throne of grace, for power to ſubdue this ſtubborn vice. This ſecond advice, St. *James* ſeems to ſuggeſt to us in theſe words, "Reſiſt the "devil, and he will flee from you;" and he immediately adds theſe, "Draw nigh unto "God, and he will draw nigh unto you." And truly, men preſume too much, when they imagine thoſe treacherous natural forces of their own, are able to redeem that ſpiritual liberty, they were unable to defend; and then they loſe their beſt advantages, when their omiſſions of applying themſelves to their Maker, makes them neglect ſupplies infallibly victorious, which wait but the imploring, to advance to their reſcue. Ceaſe not then, with *Moſes*, to lift up your hands to heaven, till you have thereby diſcomfited and deſtroyed theſe ſpiritual *Amalekites*, your vices: and believe it, prayer (to uſe a term of phyſick) is a ſpecifick remedy againſt this diſeaſe, and deſerves, that, among all the weapons proper for this warfare, you ſhould ſay that of it, that *Dævid* ſaid of huge *Goliah*'s ſword, "There is none like that, give "it me."

James iv. 7, 8.

Exod. xiii. 11, &c.

1 Sam. xxi. 9.

For prayer, performed with thoſe due rites its object requires from it, gives us ſuch awful ſentiments of God's holy name, that our conſcience will not, in a ſhort while after, permit us to diſpenſe with the uſurping it in vain. And thus, this ſacred duty does not only procure, but, in a manner, give us what we pray for: as, when ſome ſqueamiſh and diſreliſhed perſon takes a long walk to the phyſician's lodging, to beg ſome remedy for his inappetence, his very walking thither does, in ſome meaſure, give him that good ſtomach, he hopes to regain by the medicines he ſhall get there.

But if, in your firſt attempts, this ſin meet with a ſucceſs more anſwerable to your fears than your deſires, be not diſcouraged at it, but make of this delay the uſe it is intended for, a riſe of greater eagerneſs and importunity in the purſuit of your addreſſes. Nor think it ſtrange, that God ſhould make you wait a while for the grant of your requeſts, that have been ſo tediouſly refractory to the motions of his ſpirit, that ſummoned your obedience to his commands. But loſe not patience, for the wiſhed ſupply will infallibly arrive at laſt, and all your expectation will but ſerve to endear it when received; for God will not be wanting with his power to aſſiſt what is undertaken only for his glory.

Nor is it leſs our duty to truſt in his promiſes, than to obey his commands; and we may confidently expect from his faithfulneſs to the one, what he will enable our endeavours to perform the other. The great apoſtle tells us, that the ſame God will give us "to will, that worketh in us to do:" and therefore you may be confident, that (as he elſewhere ſpeaks) "he, which hath begun "a good work in you, will perform it unto "the day of Jeſus Chriſt." And on this ſcore our Saviour, who entails happineſs only to the godly, does yet pronounce them "bleſſed, that hunger and thirſt after righte- "ouſneſs," promiſing, that they ſhall be ſatisfied. Thus he, that graciouſly "accepts "the will for the deed," counts good deſires but infant holineſs, as things, that differ from more perfect graces, not in their nature, but their (age and) growth.

Phil. ii. 13.

Phil. i. 6.

Matt. v. 6.

In the mean time, let this conſideration comfort you, that thoſe ſins diſpleaſe God leaſt, that diſpleaſe the doer moſt; and that, in this, our combats againſt ſins, are differenced from our battles amongſt men; that in the former the victory depends not ſo much on our ſucceſs, as our reſiſtance; ſince none are there held vanquiſhed, but ſubmitters. And, for your farther comfort, you may take each victory grace wins of your corruptions, not only for a preparative to new ones, but an earneſt of more. For the conqueſts of ſaving grace in the ſoul are not like thoſe the ſea makes upon the ſtrand, when it makes acquiſitions by the flow, but to loſe them again within few hours by the ebb; but the expeditions of the ſpirit againſt vices are like thoſe of the crowned rider of the white horſe in the *Revelation*, of whom it is ſaid, that, "he went forth conquering, "and to conquer."

Rev. vi. 2.

DIRECT. III.

In the next place, as far as conveniency will permit, it were fit to fly the converſation, or at leaſt the familiarity of profeſt ſwearers. This advice of declining infectious company, though in a general caution ever found prevalent againſt all vices, has a peculiar property againſt this; for there being very ſmall (if any) temptation to it in our natures, it is principally imitated from others, (as when one yawns, moſt of the company, though otherwiſe uninclined to that act, do uſually yawn out of ſympathy) and ſo ſubſiſts but as it is cheriſhed by example and cuſtom, (its motive and its nurſe.) And therefore, a very effectual remedy againſt ſwearing is by converſing where it is diſcountenanced; to ſtarve it by diſcontinuance, forcing that ſhame of ſingularity, that firſt begot it, to make amends for the miſchief it has occaſioned, by employing it to the ruin of its own productions. As phyſicians make ſcorpions their own antidote, by preparing out of them an oil, that is ſovereign againſt their ſtings. Lovers of the ſame ſin may (methinks) be reſembled unto firebrands, which, being laid together, kindle each other by their mutual heat; but being ſevered, and kept ſo aſunder, each ſingle brand, after a little ſmoking, does of itſelf go out.

DI-

DIRECT. IV.

For the fourth remedy, I ſhould adviſe the ſwearer to oblige himſelf to pay or ſuffer ſomewhat for every oath he ſwears; thoſe little forfeitures ſerving both as monitors and as penalties. But if the bargain tie you to pecuniary diſburſements, be ſure diſtreſſed Chriſtians be (at leaſt) ſharers in them. For if (as divines tell us) the poor be God's receivers, they ſeem to have a title, as well by juſtice as by charity, to the amerciaments, that are eſtreated upon treſpaſſes againſt their Lord. But have a care you turn not this phyſick into poiſon, by imagining, that, when you have fined for your engagements, you have done penance for your ſins; and, by your juſtice to your compacts, cancelled your diſobedience to your Maker. No, no, God requires not, that you ſhould part with your ſixpences, but with your ſins; and the repentance he accepts, conſiſts not in a paying for, but in forſaking your tranſgreſſions. Eſteem then theſe inconſiderable mulcts but as remembrancers of your faults, not ſatisfaction for them.

Allyed to this expedient is that uſeful one of procuring ſome diſcreet friend, by putting you in mind of every oath, to force you to take notice of your faults; which this courſe will very much contribute to make you both weary and aſhamed of. Provided always, that theſe reprehenſions be as well ſeaſonable as juſt; for to correct men in the firſt violent tranſports of their choler, is, by adminiſtring phyſick in the extremity of the fit, but to exaſperate inſtead of curing. Reaſon being to our paſſions, as the wind to the fires; the ſame puff, that will blow out the flames of a candle, will but kindle thoſe, that prey upon a faggot. Reprehenſions may ſuppreſs paſſions when they are weak, but do but incenſe them whilſt they are raging. It is liſted amongſt the miracles of Chriſt, that he once chid a ſtorm into a calm.

Matt. viii. 26.

DIRECT. V.

The fifth thing, that I muſt preſcribe our ſwearer, is, to reſolve, at once, to renounce that vice, by a deſertion not only ſincere, but unſuſpended and entire. Were it but one of theſe mere moral failings, whoſe unfitneſs, or miſbecomingneſs, makes all the guilt, I ſhould, poſſibly, counſel you, to wean yourſelf of it by degrees, whoſe progreſs were ſcarce diſcernible before its end; juſt as phyſicians uſe to reclaim thoſe, that have been long accuſtomed to unwholeſom diet. But, as the ſame phyſicians, when once a dangerous ſurfeit is contracted, reſtrain not by degrees, but totally and abruptly, thoſe exceſſes, that occaſioned it, and whoſe continuance would prove fatal to the patient; ſo here, where that, which is to be forſaken, is not ſo properly a fault, as a ſin, we muſt refrain, without the leaſt exception, or connivance; ſince elſe (the thing prohibited, being in itſelf a ſin) we allow ourſelves to offend God as much as ever, though not ſo often; by committing the ſame ſins in quality, however not in multitude.

Indeed, what is leſſened by the number of our oaths in this partial reformation is recompenſed by the aggravated heinouſneſs of their nature; thoſe, that ſeemed formerly but the ſlips of infirmity, being now authorized by diſpenſation. This bare abatement of the tale of our ſins is a good refuge, but a bad deſign: many times this diminution is the utmoſt our endeavours can arrive at; but, then it ought to be practiſed, and not to be intended; for true repentance, and a purpoſe of relapſing, are hugely inconſiſtent; the one not being real, without a property deſtructive to the other; ſince he but very lamely repents his crimes, that reſolves not againſt relapſes into the crimes, that he repents. No, no; this faint deſiſting from ſome acts of vice does but endear the reſt, that is unexiled, and that importunately urge for the recalling of their baniſhed companions. This mild remiſſneſs, if it do not prune a vice, at leaſt, it does but lop it; and that prohibits not its future growth; which the only way infallibly to prevent, is, to dig it up by the roots, with the ſpade of an abſolute and irrevocable reſolve, never to accord to ourſelves, ſo much as by connivance, the leaſt licenſe, that may endanger a relapſe. In this caſe, extirpation is that alone, which can ſecure our quiet; and the only way, that leads to an eſtabliſhed ſafety, is a ſeverity, that its object ſecures from all poſſibility of exceſſes. A ſinner's condition may be reſembled to a mouſe in a pail of water; if ſhe can get out at one leap, well and good; otherwiſe her toil will prove but fruitleſs, in attempting to get out by degrees.

DIRECT. VI.

Lastly, my concluding precept is, to make frequent and ſerious reflections upon the vanity and fooliſhneſs of ſwearers, who live as if they meant to remove all our wonder from the folly of our firſt parents, that loſt paradiſe for an apple. Sure, that theſe people are not quartered in *Bedlam* (where far leſs frenzies have impriſoned many) proceeds rather from the multitude of the infatuated, than any want of madneſs in their actions: but, howſoever, wiſe men build cages for them in their opinions, and, in their ſoberer thoughts, condemn them to inhabit thoſe frantick lodgings.

That uſual expreſſion of ſcripture, which ſometimes puts the word folly inſtead of the word ſin, ſeems chiefly calculated for the ſwearer's vice, to which it does ſo eminently belong, and which is ſo uncapable of being wronged by the appellation.

Gen. xxxiv. 7. Joſh. vii. 15. Judges xx. 6.

But, to what has been already delivered, to ſhew how little ſhelter our ſwearers find from all their weak apologies, (as certainly the fruitleſſneſs and inexcuſableneſs of their vice conſidered, almoſt no ſinners have more

to anſwer for, and leſs to anſwer) we muſt now add, that they want not only the temptation of an excuſe, but the very excuſe of a temptation, unleſs its being forbidden, paſs for one. For, firſt, this mungrel iſſue cannot (as other vices uſe to be) be laid at nature's door; we cannot father it upon traduction, ſince we inherit it not from our parents; nor is it born with us, but learned by us; ſo that here, before we can be ſinners, we muſt have been diſciples. But, then, all other vices have either honour, (as ambition,) or profit, (as avarice,) or delight, (as uncleanneſs,) to plead for their excuſe; ſwearing alone can plead nothing but guilty: ſo that if ever that expreſſion of the apoſtle, which mentions
Jam. i. 21. "ſuperfluity of naughtineſs," belonged to any ſin, it is certainly here to be appropriated.

THE ſilly *Indians*, that part with gold and jewels, for glaſſes, whiſtles, and ſuch trifling gugaws, are *Solomons* to ſwearers; betwixt whoſe madneſs, and the famed folly of *Lyſimachus*, who, parched with extreme thirſt, to get a little drink, became a voluntary priſoner to his (ſoon after vanquiſhed) enemies, I find no diſparity advantageous to ſwearers; it being a leſs ill bargain, to ſell away one's liberty for one's belly-full of water, than to ſell away one's ſoul for a mouthful of air. This ſwearing is a hook without a bait: and when hell employed its ſpurious brood of vices into the world to ſeduce mankind, it furniſhed every one of them with a dowry, either of fame, of pleaſure, or advantage, to entice lovers with; only poor ſwearing was left portionleſs; a miſtreſs only for thoſe generous and diſintereſted ſinners, that need no temptation; but loving wickedneſs (as they ought to do virtue) for its own ſake alone, aimed at nothing in the act of ſin, beyond the ſatisfaction of having committed it. To whom the Lord may juſtly ſay, as he did
Iſa. lii. 3. to the *Iſraelites* in the prophet, "You have "ſold yourſelves for nought." For, whereas, uſually, thoſe vices, that riſle the ſoul, do bribe the ſenſes; in ſwearing, the poor ſoul is ſtript of her graces, and robbed of her joys, without the leaſt emolument (of pleaſure or advantage) accruing to the ſenſes. This ſwearing (in my opinion) is even as fooliſh as loving a cruel miſtreſs; a man parts with his heart, and gets nothing in exchange for it. An oath is like the powder, that charges a granado; its properties are to make a momentary, diſpleaſing noiſe, to offend thoſe, that are within the reach of it, and to ſpoil that, from which it parts. Nor is that criminal blaſt unlike the prophet's deſcription of the cankerworm; of which he gives this
Nahum iii. 16. character, that "it ſpoileth, and fleeth away."

BUT the leſs advantages this vice affords, the more culpable it is; the diſobedience, as well as folly, of a forbidden act being increaſed by the want of its being beneficial; he, that treſpaſſes for leaſt, tranſgreſſes moſt; for ſure, it is rather an aggravation, than an excuſe, of having injured any body, that you get nothing by it. The ambitious, and the incontinent, are like great ladies, that ſurfeit upon apricots, nectarines, and melons: whereas the ſwearer is but too juſtly reſembled to thoſe beggars, that kill themſelves with blackberries and ſloes, and ſuch like traſh, the excrements of hedges; having appetites as ridiculouſly noxious, as thoſe of ſome of our green-ſickneſs girls, whoſe ſtomachs riſe at dainties, and long for loam and charcoal.

FOR my part, would I renounce my intereſt in virtue, it ſhould be for the attaining of a ſcepter, a fame tranſcending *Cæſar*'s; and, in a word, where the happineſs I forfeited ſhould ſeem ſo recompenſed by that I gained by loſing it, that wiſe men themſelves ſhould have occaſion rather to compaſſionate my frailty, than admire my weakneſs. For, I confeſs, it would extremely trouble me, to hang for my thirteen-pence-half-penny; and, I am confident, that many of thoſe this ſenſeleſs vice has damned, do find a vaſt acceſſion to the pains of hell itſelf, in the conſideration of the cauſe of their enduring them.

SINCE then ſwearing is a vice ſo ill qualified, that you want a temptation to it, you find no pleaſure in it, nor do derive any advantage from it; O let not your obſtinacy to doat upon an empty, fleeting ſound, that has nothing in it of a ſin, except the guilt, hinder you from ſhunning torments, that will equal your wretchedneſs to your folly, and from keeping up a title unto joys, whoſe very hope tranſcends all earthly happineſs, by oppoſing all your paſt unneceſſary oaths, by one inviolable promiſſory one, never to ſwear needleſly again.

ADVERTISEMENT.

TO prevent all miſtakes, that may ariſe from ſome apprehenſions of mine, which (ſeeming to cenſure oaths without diſtinction) may poſſibly be ſtretched beyond my meaning, I thought myſelf obliged to declare, that in no part of this diſcourſe my intention was to juſtify that plauſible error of our modern anabaptiſts, that indiſcriminately condemn all oaths as abſolutely and indiſpenſably prohibited and aboliſhed by the goſpel; my deſign being only to reſtrain the needleſs abuſe, not interdict the neceſſary uſe of ſwearing. Whoſe criminouſneſs if not in this diſcourſe I have repreſented in its moſt enlarged dimenſions, I may find an excuſe in the precedent and practice of thoſe painters, who being to draw upon the concaves of the roofs of churches, make their pictures more gigantick than the originals they are to reſemble; to recompenſe by that advantage in the dimenſions, what the eye loſes by the diſtance from the object. For every ſinner naturally beholding vice, upon which he doats, through the contracting optick of ſelf-love, muſt have the idea of his crime enlarged beyond its true proportions, to make him ſee it in its juſt quantity. I might add, that it is ſcarce poſſible to paint this ugly negro in blacker colours than his own; eſpecially ſince now this is grown ſo much in faſhion, that it ex-

pects not (as moſt other vices) ſlow time or years to ripen it; ſince in our very ſtreets we hourly hear children (who ſure offer up oaths as the firſt-fruits to the devil) ſwear, that can ſcarcely ſpeak; and ſee them perfect in their father's language, before they are old enough to ſpeak their mother-tongue.

But though in the heinous properties of this vice I might find cauſe enough to juſtify more fierceneſs, than I have expreſt againſt it; yet ſhould I be extremely loth, with many much better ſtored with zeal than charity, to doom all thoſe to hell, that through frailty or temptation ſometimes let ſlip an oath. For ſo ſevere a ſentence may perhaps concern too many, whoſe addictedneſs to other, not to greater ſins than ours, makes often all the difference of our guilts; and who in ſpite of all their ſlips and ſtumbles by the way, may by repentance arrive ſafely at the heavenly *Canaan*: and therefore I ſhall conclude what has been ſaid of ſwearing, with this ſenſe of it, that it is a ſin too heinous to excuſe neglect, and too venial (if I may ſo ſpeak) juſtly to beget deſpair.

A

DISSUASIVE

FROM

CURSING.

For Mr. *W. D.* to Sir *G. L.*

I HAVE too much paſſion for your perſon, to have any complaiſance for your faults; and ſtill have loved you at ſo high a rate, that I had rather hazard the loſs of your affection, than decline any proofs of the reality of mine. It is not, that I am not as unwilling to employ cenſure, as I am confident you will be troubled to have neceſſitated it from me; but (all conſidered) I have too much friendſhip, to have courtſhip enough to let ſlip ſo fair an opportunity as your forced converſation with *Cleander*, to ſhew you in him the deformity of a vice, from which I wiſh you were as free as from all other crimes.

Certainly, if curſes were as much the badges of a gentleman as he thinks them, men would not gueſs him to be of a lower order than that of emperors: and if the devil were to fetch all thoſe he bids him take, his water-dog would not have half ſo buſy an employment; hell would have cauſe to praiſe his liberality; and were not Satan ſtill the father of lies, he could not but acknowledge, that none of the ſeven deadly ſins, (nor perhaps all together) ſent thither half ſo many. If I thought *Cleander* would take it for a diſſuaſion, that I proved curſing to be a ſin, I could be as ready to bring prohibitions of it out of ſcripture, as he is to tranſgreſs them. The prophet *David* (imitated by the apoſtle *Paul*) makes it the character of the wicked, that "his mouth is full of curſing." And in another place, that "they curſe inwardly." And ſuitably to his own doctrine, when *Shimei* (equalling his curſes to the number of his ſteps) railed at him with as many imprecations as he deſerved bleſſings, he did not (to ſpeak St. *Peter*'s language) render "evil for evil, or "railing for railing;" but only anſwers, "Let "him curſe, it may be the Lord will look "upon mine affliction, and that the Lord "will requite me good for his curſing this "day." Our Saviour commands us to bleſs even "thoſe, that curſe us; nay, bleſs "them, that perſecute you. Bleſs (ſays St. *Paul*) and curſe not." And to ſhew you, that it was not only his precept, but his practice, "being reviled (ſays he) we bleſs; be-"ing perſecuted we ſuffer it; being defamed "we intreat." Imagine then you hear the apoſtle ſaying, as in one place he does, "Be "ye followers of me, as I alſo am of Chriſt; "who (ſays another apoſtle) when he was "reviled, reviled not again; when he ſuf-"fered, he threatned not, but committed "himſelf to him that judgeth righteouſly." And in effect, when upon the *Samaritan* clown's refuſal to receive Chriſt, the two fiery-ſpirited diſciples deſired leave to call down fire from heaven (to conſume thoſe by the fury of that active element, who refuſed entertainment to him that created it) our Saviour anſwers, but with a rebuke, and telling them, that they "knew not what manner of "ſpirit they were of."

If then, in ſpite of provocations we are enjoined to return prayers for maledictions, ſure we, that are forbidden to retribute curſes, are much more prohibited to laviſh them. And if we will take the pains to ſhrive, and to look back into their pedigree, we may diſcern in them a hereditary guiltineſs, and ſhall find them ſinful (if I may ſo ſpeak) by traduction,

1 Pet. iii. 9.
2 Sam. xvi. 11, 12.
Mat. v. 44.
Rom. xii. 14.
1 Cor. iv. 12, 13.
1 Cor. xi. 1.
1 Pet. ii. 23.
Luke ix. 54, 55.
Pſalm x. 7.
Rom. iii. 14.
Pſalm lxii. 4.
2 Sam. xvi. 5. & 13.

traduction, they being but the emanations and ſallies of a temper extremely unconſonant to Chriſtianity; of which our Saviour makes "love" the diſtinguiſhing ſignature: and St. *Paul* tells us, that "the end of the command-"ment is charity." Of which in another place he gives this character, that "charity "ſuffereth long, and is kind; doth not be-"have itſelf unſeemly, beareth all things, "is not eaſily provoked;" with many other properties of the ſame nature. Inſomuch, that St. *John* ſcruples not to affirm, that if a "man ſay, I love God, and hateth his bro-"ther, he is a liar;" (as concorporating things inconſiſtent, and uniting things diſtanter than the two poles of heaven:) and therefore when St. *James*, ſpeaking of the tongue with a certain kind of wonder, in theſe terms, "Therewith "bleſs we God, even the father; and there-"with curſe we men, that are made after the "ſimilitude of God: out of the ſame mouth "proceedeth bleſſing and curſing;" he adds, "My brethren theſe things ought not ſo to "be." And ſurely too the goſpel teaches us, that theſe aſſaſſinates and murderers of the heart, for being bloodleſs, are not therefore guiltleſs.

John xiii. 35. 1 Tim. i. 5. 1 Cor. 13. 4, &c. 1 John iv. 20. James iii. 9, 10.

BUT granting the ſin to be as venial as indeed it is heinous; (and that by uſing curſes men do not merit them) yet certainly the multitude of *Cleander*'s faults would give them that danger, that is pretended to be wanting to their nature; and he, that conſiders, that thoſe little drops of rain, which ſingle ſeem but ſo many liquid atoms, do often (united by their confluence) ſwell into torrents, nay, (ſometimes) into deluges, will eaſily believe, that curſes cannot but be extremely criminal in that *Cleander*, that curſes as if he were an inhabitant of mount *Ebal*; and who is ſo reſolved not to keep the devil's counſel, by concealing any impious ſuggeſtions, that were but his prayers as frequent as his curſes, he would ſeem to obey literally that qualified injunction of the apoſtle, of "praying with-"out ceaſing."

Deut. xi. 29. 1 Theſ. v. 17.

I MIGHT add, that in moſt of theſe imprecations, God's ſacred name being clearly taken in vain, renders theſe *Ebalites* guilty of the breach as well of the ſecond commandment of the firſt, as of the great commandment of the ſecond table, unleſs they will juſtify themſelves from that crime, by the owning of a worſe; I mean, demonſtrate, that they did not employ God's name to no purpoſe, by confeſſing they employed it to a bad one.

AND now this laſt conſideration leads me to that of the unreaſonableneſs of curſing; for it is not a fit thing, that upon every little accident, that *Cleander*'s vexed at, the creatures of God muſt inſtantly change maſters, and devolve to the devil. Were it not very juſt, that God ſhould be the executioner of all the raſh decrees his pettiſh paſſion makes; and his Creator's power ſhould have no other employment, but to run on errands (at the moody gentleman's beck) often repugnant to his juſtice, and ever to his mercy?

NAY, how often has *Cleander* in his paſſion wiſhed things, whoſe accompliſhment himſelf confeſſes would have made him miſerable? And is it then either the part of a good man to make wiſhes, that are unlawful, or for a wiſe man to frame deſires, of which he need repent the grant? One imprecation amongſt the reſt *Cleander*'s very ready in, which (with as little caution as he commonly obſerves) I would not have pronounced for as many kingdoms as he has uſed it times, and that is, "the devil "take me." For ſure God, (as we are ſure he may, and know not but that he will) give the devil leave to take him at his word, in what a caſe were he? And what curb ſhall we henceforward think ſtrong enough to bridle his corruption, when what to the wickedeſt is the greateſt terror, he makes his wiſh?

THERE was ſome years ago in *Geneva* an Italian, (both by extraction and humour) who riding a handſom mare in a ſolitary angle, was by the devil ſeduced to ſtallion her himſelf. The fact once done, the horror of a crime, that made him more a beaſt than that on which he acted it, tranſported him ſo far, as to make him give himſelf to the devil, if ever after he relapſed: but ſome while after, forgetting both his conſcience, and the condition of his vow, he was fatally tempted to repeat his former beaſtlineſs in the ſelf-ſame place; which he had ſcarce compleated, before the devil appearing to him viſibly remembers him of his forgotten promiſe, and claims the forfeiture: the trembling wretch, to avoid the being hurried away inſtantly from the hell he felt, to that he feared, compounds with the devil to reſign him his ſoul at the expiration of a limited reprieve: but before that time came to be effluxed, it pleaſed God to viſit both himſelf and the place of his reſidence with the plague; which rouzing his ſeared and lethargick conſcience, forced him to expreſſions of his anguiſh, unuſual enough to make his companions inquiſitive into the cauſe; which having fully and circumſtantially confeſt, he was after his recovery, upon that evidence, accuſed of having carnally abuſed a beaſt, and having made a compact with the devil; which latter, though upon a repentance ſuitable to his ſin, God's mercy did diſannul, yet the juſtice of the magiſtrate did for the former crime condemn him to a death he richly had deſerved, and penitently endured. This ſtory I thought not impertinent to inſtance in, to teach us how dangerous and unſafe it is to preſent that to the devil, for which Chriſt ſhed his blood; and (with more wearineſs than *Cleander* can pretend to) to offer that to one, that is greedy to ſnatch (and therefore ſurely willing to accept) that which the whole buſineſs of religion is to defend and reſcue from his attempts. The ſtory itſelf may teach us, that though we are never to deſpair of God's mercy, we are as ſeldom to provoke his juſtice. I have given it you in the very words of our friend Mr. *Boyle*, who had it upon the place from an excellent divine of that republick; to whom the delinquent himſelf confeſt it, as to him,

that

that was aſſigned to comfort and aſſiſt him at his death. And the inſtances are not unfrequent in the moſt credited authors of thoſe, whoſe imprecations God has puniſhed by granting them.

BUT I had almoſt forgot to mention one opportunity, to which the devil is indebted for a vaſt number of *Cleander*'s curſes, and that is his gaming; for the leaſt frown of chance upon him then gives fire to whole volleys of curſes againſt fortune; if at leaſt they deſerve not a more heinous title than barely that of curſes, who in ſeverer men's opinions are guilty of an (at leaſt) implicit blaſphem-
Prov. xvi. 33. ing; ſince *Solomon* does diſcreetly affirm, that all the croſs and happy lucks at play are not raſhly or deſignleſsly ſhuffled by a blind hazard, but are diſpenſed by an all-ruling providence.

I DETERMINE not here, whether theſe words of the wiſe man (according to the received opinion of divines) may be extended to an abſolute ſentence of condemnation againſt all games of hazard; but this I know, that (not to inſiſt on that injunction of God
Exod. xxiii. 13. to the *Jews*, "Be circumſpect, and make "no mention of the names of other gods, "neither let it be heard out of thy mouth;)" it is very unfit, that under the ſun-ſhine of Chriſtianity, we ſhould build or repair the ruined altars of depoſed chance, and acknowledge a blind deity; that under the abuſed name of fortune, fools anciently were pleaſed to create a goddeſs, and ſinners now diſſemble to miſtake for ſome ſuch thing, that they may unreproved controul and cenſure thoſe heavenly diſpenſations their proud and peeviſh natures are diſpleaſed with. I know, that many unforeſeen accidents, which the ignorant vulgar do impute to fortune, are by God in the ſcripture aſcribed to providence: and therefore you muſt give me leave, both to take notice of, and diſapprove that ungrateful expreſſion of our language, wherein (to juſtify our unthankfulneſs for the benefits we have received) we uſe to call God's bleſſing to a man in his outward poſſeſſions, his fortune; as if our eſtates were gifts blindly caſt on us by the raſh profuſeneſs of that fond deity, and not the emanations of God's bounty, and preſents of his promiſe. Old
Gen. xxxiii. 11, & 5. *Job*'s gratitude ſpeaketh another ſtrain, and will not mention his wealth (though never ſo juſtly the wages of his proſpered induſtry) without acknowledging it for the gift of God.

BUT ſince this much-abuſed name of fortune has preſented itſelf in my way, I dare not take leave of it, till I have expreſſed a deſire, that men would be more wary how they defame her, leſt through the ſides of fortune they affront providence. If fortune, under the common notion, had fee'd me to be her advocate, I ſhould alledge, that gameſters, of all others, have the leaſt juſtice to complain of her diſfavours, ſince the ſucceſs of the one abſolutely depending upon the loſſes of the other, they themſelves reduce fortune to a neceſſity of diſobliging ſome of them, by rendring it impoſſible for her to content them all. And I would add, that what we fondly call her inconſtancy, when ſhe ſometimes forſakes thoſe ſhe once ſmiled on, is much more properly to be aſcribed to the juſtice of her goodneſs, and the extenſiveneſs of her affection to men; ſince ſeeing ſhe is not able to make them all completely happy at once, at leaſt ſhe endeavours to make them fortunate by turns, and for ſome intervals of time.

NOR is it her fickleneſs, that in purſuance of this impartial love, ſhe ſeems to deſert her former favourites, when ſhe confers her favours on new perſons, ſince ſhe bereaves not the firſt poſſeſſors of them with intention, but only by conſequent; as being not able to lend her benefits to new neceſſities, without redemanding them of her former debtors; whom, otherwiſe, ſhe has as little deſign to offend by this tranſplacing of her bounties, as the ſun has to benight the antipodes, when to bring light into our hemiſphere, he is neceſſitated to leave them in darkneſs.

IT is not the malice or inſtability of fortune, but our miſtakes of the nature of her preſents, that occaſion our complaints; for we miſtaking thoſe benefits for abſolutely given to us, which are indeed but depoſited in our hands, repine and murmur at their reſtitution, inſtead of being thankful for their loan, and having had their uſe. And ſurely they, that pretend to be ſo perfect in her conſtancy, muſt be guilty of more madneſs in truſting her, than ſhe can be of treachery in deceiving them.

BUT were I to frame an apology to vindicate fortune under the notion of providence, I might repreſent, that what we attribute of her envious partiality, when ſhe does ſhower moſt favours on thoſe, that leaſt deſerve them, is but the effect of God's immenſer bounty, that gives even them a larger portion of pleaſures in this life, to whom he reſerves none at all in the next; and withall caſts a diſeſteem upon theſe glittering goods, fools over-value, by heaping them upon his very enemies.

I MIGHT farther alledge, that what our diſcontents call fortune's ſpitefulneſs, and her injuſtice, when ſhe ſeems to perſecute thoſe moſt, that are moſt virtuous, is in effect but God's care of his children, which by theſe afflictions both exerciſes and improves their piety, ſecures them from the allurements of proſperity, endears his aſſiſtances and his recompences by theſe difficulties; which both add luſtre to their victories, and make their virtues more exemplary and more meritorious.

AND (laſtly) I might ſay, that what we miſcall inconſtancy in fortune, when her changes invalidate the title of preſcription to her favours, and make their reſidence (when poſſeſſed) as incertain as their wiſhed ſtay is welcome, is indeed but a merciful ſtratagem of providence, to wean us from a dangerous fondneſs of theſe tranſitory goods; leſt, if the continuance of their fruition were as certain as the contentments of it are great, we

ſhould, by neglecting, forfeit all nobler joys, and loſe far greater pleaſures reſerved for us in heaven.

BUT we have too long wandered from our theme; let us return to *Cleander*, and his curſing; which, over and above thoſe other good qualities we have already obſerved in it, has that of being a ſin as uſeleſs as it is unchriſtian. All other vices have ſomething to extenuate their guilt; all other ſinners ſerve Satan for his pay; but the curſer (as the ſwearer) is the devil's voluntier, valuing his ſoul ſo cheaply, that ſome ſuſpect, that the reaſon of its ſtay in the body is, that the devil ſcarce thinks it worth the fetching: and certainly, *Eſau*'s bargain, who ſold his birthright for a meſs of pottage, becomes no more abſurd, when parallelled to this; which makes thoſe it damns, as much admired for their folly, as tormented for their ſins; and ſo caſts upon them the imputation of madneſs, that it deprives them of the privilege of madmen; for whereas frantick perſons (who innocently act all crimes) may kill men without murther, the curſer (on the other ſide) does murther without killing.

Gen. xxv. 33.

CLEANDER may, indeed, give himſelf to the devil by his curſes, but never his enemy; for if *Solomon*'s authority be credited in this point, we ſhall believe, that, "as the bird by "wandering, as the ſwallow by flying, ſo "the curſe cauſleſs ſhall not come." But the beſt of it is, that theſe intentional ſins, for being ineffectual againſt others, diveſt not the being criminal in themſelves: for the curſer is as uncharitable to himſelf, as to his enemies; he commits murders, without acting them; and contracts the guilt of his neighbour's blood, without ſhedding it; and incurs the penalty, without once taſting the ſweetneſs of revenge. For it is not only in good, that God accepts the will for the deed; he makes the ſame reception to our endeavours and deſigns of ill. And juſtly may God puniſh the ill by us intended, though by him prevented; ſince that diſappointment, in which we think to find our juſtification, is not the effect of our want of malice, but our want of power; and ſo does not excuſe our ill, but magnifies God's goodneſs. Let us therefore ceaſe to wonder, that whilſt we curſe one another, our Maker curſes us; and that the plague is ſo raging in our houſes, ſo long as it is ſo riſe in our mouths: but rather, let us tremble at that diſmal fate, that *David*, praying againſt his enemies, propheſies againſt God's. "As he loved "curſing (ſays he) ſo let it come unto him: "as he delighted not in bleſſing, ſo let it be "far from him: as he clothed himſelf with "curſing, like as with his garment; ſo let it "come into his bowels like water, and like "oil into his bones."

Prov. xxvi. 2.

Pſal. cix. 17, 18.

I MIGHT yet farther alledge, that curſes are of ſo culpable a nature, that their very apology concludes them guilty, by pleading them to be idle words: and I might add to all the paſt diſſuaſives, the ill repute, that curſes gain a man, amongſt the moſt ſcrupulous and preciſer ſort of people, who judging of the greatneſs of the vice, by the ſmallneſs of the advantage that is derivable from it, will hardly believe him to be the owner of much piety, that will ſlight it upon ſo little a temptation. And thoſe of our divines, that hold curſes to be the dialect of the reprobates in hell, will think it but an ominous piece of providence in *Cleander* to imitate travellers, who uſe to accuſtom themſelves beforehand to the language of thoſe climes they deſign to viſit. But the laſt conſiderations that I ſhall employ, to perſuade you to diveſt, with the practice of uſing curſes, the means of provoking them, and the fears of ſuffering them, is that of the ſcandal this vicious cuſtom gives to weaker Chriſtians. And as the former conſiderations relate properly to *Cleander*, ſo this I muſt more peculiarly addreſs to you, whoſe virtues have acquired you ſo high a reverence, that they have put it in your power, not only to excuſe, but almoſt to canonize the worſt actions by your example; and therefore ought to make you ſo much the more wary and ſtrict in your behaviour: ſince men believing it impoſſible to fail in imitating you, your exemplary faults will contract a deeper guilt by being precedents, than by being ſins.

Matt. xii. 36.

BUT, Sir, leſt I ſhould give you too juſt an occaſion to encreaſe the number of your curſes, by beſtowing ſome freſh ones upon my tediouſneſs, I will now put a period to your trouble, by ſaying to you, as once our Saviour did to the young man in the goſpel, (that ſo reſembled you in the poſſeſſion of ſo many virtues) "One thing thou lackeſt" (yet); and that one thing in you is, but, by ſacrificing your habitude of curſing, to make yourſelf capable of as tranſcendent bleſſings, as conſtantly are implored for you, by,

Matt. x. 21.

SIR, Your moſt affectionate,

moſt faithful, and

moſt humble ſervant,

W. D.

LETTERS

FROM AND TO

Mr. *BOYLE*,

AND

TRACTS by him,

Now firſt publiſhed from the Originals.

LETTERS

OF

Mr. *BOYLE*

TO

SEVERAL PERSONS.

SIR,

THOUGH the favours you heaped upon me at *London*, were both very numerous, and very great; yet cannot I eſteem any (not to ſay all) of them ſuperior to the welcome promiſe you were pleaſed to make me before, and confirm at our parting, of a conſtant correſpondency during our ſeparation. For not only your letters will continue to me the happineſs of your converſation, but will hinder it from becoming occaſionally a diſquiet to me; which it would certainly prove, if, having enjoyed it enough to long for more of it, your pen ſhould not gratify the deſires your tongue hath created. Since then, Sir, you are pleaſed, not only to allow, but to command me to write to you, I am too much a friend to my own inclinations, not with equal joy and readineſs to obey you: and I hope you will pardon me, if my deſire of ſeeing the Engliſh language honoured by your ſkill in it, make me willing to engage you to be more converſant with it, by employing it in my letters to you. And the ſame juſt concern for the glory of the Engliſh tongue obliges me to beſeech you, not to do it the injury to judge of it by my writing it; for it is not more true, that, being a very bad ſecretary, I cannot expreſs my thoughts otherwiſe than very dully in it, than it is, that my uneloquent expreſſions are imputable to the writer, not the tongue; for I think I may ſay, without flattering it, that though I have been a much greater ſtudier than prizer of languages, I have not learned any beſides the Greek, in which good thoughts may be expreſt with leſs diſadvantage; and that he would be ſuperior, both to *Demoſthenes* and *Cicero*, that were fruitful in as choice conceptions as may be happily expreſt in Engliſh. All this I had ſooner written to you, and had earlier paid you the duty of this letter, if I had not been withheld by the apprehenſion of diſturbing your joys. For I am told, that Hymen makes you recant the opinions you lately defended againſt the ſovereignty of Cupid: they ſay, your grand theme is now no longer the prerogatives of a free heart, and the advantages of a ſingle life, but a certain frame of mind, expreſt long ſince by

* *Omnia vincit amor, & nos cedamus amori.*

But though your late contempt of love and women, and the railleries, with which you threatened me, in caſe I did what I may now do only to imitate you, give me both cauſe and riſe enough to puniſh you, and to let you ſee, that I have not been cauſleſly thought ſufficiently ſtored with declamations againſt Cupid and Hymen; yet I ſhall willingly ſacrifice my reſentments, and this inviting opportunity of expreſſing them to your alliance with honeſt Mr. *Hartlib*. For I cannot conclude you leſs a ſervant to philoſophy, by chooſing a miſtreſs in his family; and I cannot but look upon it as an act of his grand deſign to oblige this nation, that he hath found this way to detain you amongſt us.

SINCE I began this letter, I received a peremptory information of your marriage, in which I wiſh you and your bride as much happineſs, as ever that relation afforded any. A longer letter would now, perhaps, be an unſeaſonable interrupter of your joys; and therefore, though not to violate the laws of our commerce, I dare not ſend away this paper without ſomething philoſophical in it; yet what I ſhall now encloſe you, ſhall be only a way to make wine to drink the bride's health; which (as little as I love any ſtrong drink) that I may do to you, I heartily wiſh myſelf for a few hours at *London*. Having received this proceſs from a friend as a ſecret, I ſhall beg you would not let it loſe that name: and if the inventor of this artificial wine do not flatter it, *England* may afford us as generous, though not as laſting wine as the *Canaries*. I ſhould now likewiſe ſend you the way of making wine and ſpirit of wine out of corn; but the unwelcome affairs, that diſtract me here, have at preſent put it out of my head; and the papers I have of it being in one or other of my trunks, ſome of which are already ſhipt, and the others ready to be ſent aboard, I muſt ſuſpend the ſending you

that proceſs, till the next trouble I give you of this nature; and, in the mean time, ſhall deſire you, to do me the favour to name me an humble ſervant to the fair lady, that hath freed you from the conſtant trouble of defending your heart: for though in making herſelf happy, ſhe have obliged all the ingenious perſons in *England*, by procuring them the happineſs of your preſence; yet is there none in all that numerous company, that her ſtopping you at *London* hath ſo highly and ſo ſenſibly obliged, as he, that ſtiles himſelf,

SIR,

your moſt affectionate,

Briſtol this 27th of *September*. moſt faithful, and moſt

obliged humble ſervant.

[This letter was probably written to Dr. *Clod*, who married a daughter of Mr. *Hartlib*.]

SIR,

I RECEIVED juſt now, in a letter as worthy of you, as I am unworthy of it; a of praiſes ſo unexpected, and ſo unmerited, that only its ſuperſcription alone made me think myſelf at all concerned in its contents. Nor muſt I miſtake you and myſelf ſo much, as to think it either ſhould or could be anſwered or believed: I know you write it rather to expreſs your wit, than your opinion; and I perceive, that your rhetorick being enjoined a maſterpiece, has made ſuch uſe of your civility to beguile your modeſty, that, to do herſelf right, under the notion of doing me an honour, ſhe hath drawn you unawares to ſend me your own character; which I value too much, and have too little title to, either to own or keep, and which therefore I reſend you (as a miſtaken picture to its true original) being not a little ſatisfied to find myſelf in a condition to exempt myſelf by an act of juſtice, from the neceſſity of committing one of dulneſs; of which nature any thing muſt unavoidably have appeared, that had pretended to return your compliments in any but your [their] own expreſſions, they being ſuch tranſcendent and obliging ones, that even as much eloquence as you are pleaſed to aſcribe me, would not yet anſwer that you have aſcribed it with: and you alone have wit enough to ſay, what you have merit enough to deſerve to have ſaid to you. But, truſting my obedience with the manifeſting of my gratitude, [reſentments] I ſhall proceed to tell you, that I perceive, by the obliging expreſſions you are pleaſed to convey your commands in, that *Theodora* hath been introduced into your eſteem by a ſo partial a character, that the juſt apprehenſion, that her preſence might deſtroy it, would make her unwilling to be known to you under any other notion, if ſhe were not infinitely more concerned in her felicity than her reputation [glory]. But ſhe had rather acquaint you with her imperfections, than live any longer a ſtranger to your virtues; and therefore thus readily accepts your invitation: though ſhe ſays it would be without ſome trouble, that ſhe ſees herſelf neceſſitated to make fame ſo ill a return [requital] for the ſervice ſhe has done her, in recommending to you, as the diſcrediting her introducer with you, if ſhe ignored the over-raiſing expectation to be the ſubtileſt and prejudicialleſt calumny.

SIR,

I ACKNOWLEDGE myſelf to be much beholding to fame for having procured me the honour of your letter; and I am not a little tempted to be proud, that *Carneades*'s reaſonings have brought ſo great an *Helmontian*, as you yourſelf tell me you were, to doubt with him, of ſome opinions, that chemiſts do very generally acquieſce in. But though I may, perchance juſtly enough, pretend to be ſomewhat wary in admitting, and free in examining, ſuch hypotheſes, as I judge to be of moment in philoſophy; yet in other things I readily confeſs, that fame has flattered me; and that I am far from pretending to be maſter, either of the alkahiſt, or of thoſe other great Helmontian and Paracelſian arcana, of which you ſeem to ſuſpect me to be a poſſeſſor; though as to chemical experiments of an inferior ſort (which yet may be not uſeleſs in philoſophy or in phyſick) I may poſſibly be acquainted with ſome of them, which I have not been unwilling to exchange for others of the like nature, with perſons curious of ſuch matters. But I am very ſorry, that I cannot at preſent make benefit of the litterary commerce, that is ſo civilly offered me by ſo learned a man. For I have had this great while ſo great a weakneſs in my eyes, that it is exceeding troubleſom to me, to write even ſhort letters; inſomuch that I have not theſe many months written any to my neareſt friends. And I am now ſo buſied about the publication of experiments and obſervations, that I had formerly made, and conſigned to paper, concerning cold, that that work has, ſince I received your letter, ingroſſed all the time I had to ſpare for philoſophical employments. But though I am not ſo happy, as to be in a condition of making uſe of the correſpondence you are pleaſed to invite me to; yet I am not ſo unjuſt, as not to receive ſuch a favour with the reſentments that become your, *&c.*

SIR,

I FREELY confeſs to you, that I was ſo troubled and diſcouraged by having had the number of the firſt books, that I writ, leſſened by more than one, that were ſurreptitiouſly got away from me; that I afterwards, to ſecure my ſelf againſt the like loſſes of a whole treatiſe at a time, reſolved to write in looſe and unpaged ſheets; and ſometimes (when I had only ſhort memorials, or other notes, to ſet down) even in leſſer papers. And

And though I knew it probable, that by this courſe I might loſe ſome papers, yet ſuppoſing I ſhould by that courſe keep ſome men from the temptation they had before, I preſumed, that, by the help of the remaining papers and my memory, I ſhould quickly be able to ſupply the loſs of a ſheet or two, in caſe it ſhould happen.

BUT after that I have thus confeſſed, I muſt alſo acknowledge to you, that after the weakneſs of my eyes had, by diſabling me to write myſelf, reduced me to dictate and commit my papers to others, when I came to tack the looſe ſheets together into entire treatiſes, I found, that, through the negligence at leaſt of ſome men, if not alſo the fraud of others, ſo many were miſſing, and ſome of them (that had lain the longeſt by me) ſuch as I could not retrieve out of my memory, that I thought fit to comply in great part with the advice of a friend or two, who being unwilling, that ſuch things ſhould periſh to me, as well as others, by vaniſhing out of my memory, were deſirous, that I ſhould ſet them down, as they occurred to me, in one book, to be committed to ſome truſty and friendly perſon. And accordingly I have here cauſed divers of my ſcattered memorials and notes, and other looſe papers, to be tranſcribed, without any coherence, or any other order, than that wherein they chanced to occur to me; adding, here and there, divers later obſervations and thoughts, which, upon occaſion adminiſtred by theſe tranſcribed paſſages, came into my mind: and though ſeveral of them may ſeem but bare hints, and, perhaps, ſome of them but mere ſimilies, and other kinds of expreſſion; yet I forbear not to annex them, becauſe they have ſuch relations to the diſcourſes they belong to, as to be fit to bring again to my remembrance the whole paſſage, and perhaps the ſubſtance of the whole diſcourſe, whereto they appertain.

The marginal notes, that expreſs to what book, or tract, already divulged, the paſſages are to be inſerted, or to which of the unpubliſhed papers they belong, may be, to you, that are pleaſed now and then to give your ſelf the trouble of ſurveying ſome of my writings together, not wholly unacceptable; as well as it may prove uſeful to me, by facilitating my referring them, upon occaſion, to their proper places. And ſince you have been pleaſed to encourage me, I ſhall preſume upon your pardon, if I commit this rude and undigeſted heap of materials to your cuſtody, to which I ſhould, with much more willingneſs, and no leſs confidence, intruſt, if I had them, necklaces of pearl, than ſuch heaps of oiſter-ſhells; and therefore I ſhall not fear a refuſal, when I deſire, that theſe mangled papers may, during my life, be expoſed to no other, than to ſuch favourable eyes (as well as diſcerning ones) as yours, without the expreſs conſent of,

SIR,

your moſt affectionate

and humble ſervant.

Kenſ. Dec. 12.

SIR,

IT was my unhappineſs to be obliged, by going out of town, the ſame day I ſaw you at *Greſham* college, to be deprived of the ſatisfaction of waiting on you, at your own lodgings, before you returned to *Oxford*. I ſent two ſeveral times to enquire after Mr. *Pool*'s book; but the firſt day, by a miſtake in the direction, the meſſenger miſſed of your ſon's houſe; and another day, he found the houſe, but not Mr. *Wallis* at home; ſo that, till ſome hours ago, they were not brought to my lodging; which, I hope, will procure me your pardon, for not ſooner acknowledging the favour you did me, in relation to them. The news here is neither very conſiderable, nor very certain. I was yeſterday at *White-hall*, and was informed, that his majeſty is learning ſomething of the mathematicks, and that, as they ſay, of your brother, the biſhop of *Saliſbury*. Whilſt I was there, the king ſent for Mr. *Mercator* to come to him; but he being not found in the way, I could not learn of him, as I elſe might have done, what ſervice was required of him; but was only confirmed, in the general, that his majeſty's laudable curioſity now applies itſelf to mathematical enquiries; which *Plato*'s prognoſtick about philoſophiſing monarchs will, I preſume, make no unwelcome news to you; on which account it is ſent you by,

SIR,

your moſt affectionate friend

and moſt humble ſervant.

THE permiſſion you were pleaſed to vouchſafe me, of begging in your letters ſome part of that ſatisfaction I am neceſſitated to relinquiſh with your company, is that, which gives you the trouble of this letter, and me the confidence of giving you this trouble. Which I do with the leſs ſcruple, becauſe your converſation hath aſcertained me, that what I moſt do want, you can as eaſily ſpare. For I deſire not to put you to the trouble of gadding to *White-hall*, or *Weſtminſter*, to ſend me the intelligence of what is reſolved or voted there. No; without ſtiring out of your laboratory, you may give me all the information I ſue for; ſince I beg no account of any thing but of what is done there; and ſhall deſire no Mercurius to march on any other than on Vulcan's errands. And I know your letters (as well as your diſcourſes) are as naturally more fertile in philoſophy, than news, as oiſters are in pearls, than in rattles. I need not mind you of the obſervation, that chemiſts acquaintance is of age at a day old. (As the needle and the loadſtone, at their firſt meeting, cloſe, as if they did ſo upon an age's friendſhip.) For you know, that Vulcan is a quicker mediator of amities, than even Virtue herſelf:

herſelf: And thoſe metals, that grew in (never ſo) diſtant mines, he can, in a few minutes, perfectly and exactly aſſociate and unite. Nor ſhould I regret the time and pains I have ſpent in chemiſtry, though I had never derived from them any other benefit, than their having thus early radicated my acquaintance with you; from whom I muſt now earneſtly beg the favour of that correſpondence, with whoſe promiſe you had the charity to ſweeten my unwelcome ſeparation from you. But I ſhall not only conſent, but article, that not alone all ceremony and compliment, but even all rhetorick and care of language, may be ſeverely baniſhed from our commerce; as things yet leſs conſiſtent with chemiſtry and employedneſs, than with freedom, or with truth: And for my part, ſo your letters be but as fraught as your diſcourſes with gold of Ophir, I ſhall very willingly bate you the apes and the peacocks; which I know too, that one ſo rich, in all but trifles, as you, would find as much a more unobvious, as a leſs valued freight. That, which would moſt trouble me in this philoſophical traffick, would be, that its advantages will be too entirely mine (ſince I fear my retributions will be ſo trifling, as to amount but to acknowledgments, not exchanges) but that I conſider, that in knowledge it is as much more glorious, as more bleſſed, to give than to receive; ſince where our returns cannot encreaſe your knowledge, they argue it; and in as celebrating a way, as the ſtars do the ſun's tranſcendent brightneſs, by their diſability to heighten it by all theirs. And ſince the mind's intellectual ſplendor, knowledge, both as a good and as a light, muſt doubly joy in that kind property, diffuſion, I ſhall not deſpair of making you at leaſt ſuch an acknowledgment, as the moon makes the ſun, by her reflections encreaſing light, though ſhe encreaſe not his. For I intend to court nature as eagerly as ſuch a diſaccommodated ſolitude will permit me; and give you a faithful account of my proficiency in her favour by your mediation and influence: but at preſent the unlucky and unexpected lingring of the waggon, which is to bring me all my Vulcanian implements, and my neceſſitated idleneſs, till they come, makes me wiſh it drawn by Pegaſuſſes, and think it drawn by ſnails; and makes me ſadly walk up and down in my laboratory, like an impatient lutaniſt, who has his ſong-book and his inſtrument ready, but is altogether diſprovided of ſtrings. This unſeaſonable diſaſter, by enforcing an unlooked for backwardneſs in my preparations, does alſo conſtrain me to mind you of thoſe remedies you were pleaſed to promiſe me the maidenhead of (and principally thoſe againſt the ſtone and the ſmall-pox, the former of which does now diſquiet me, and of which the latter is very rife in theſe parts) and to beg, that, as ſoon as you have made them, a proportion of them may be conveyed to him, who will not fail, at his next remove to *London*, to make your favours all the acknowledgments and the returns, that may become the gratitude and manifeſt the friendſhip of, Sir, *&c.*

Dear Mr. WORSELEY,

YOUR ſilence would extremely trouble me, if, as it denied me the happineſs to hear from you, I had alſo miſſed the contentment of hearing of you. But this laſt I received in a letter of my ſiſter *Ranelagh*, together with the welcome news, that your propoſitions had already paſſed the houſe of lords (who it ſeems are at leiſure to hear petitions, now they have little or nothing elſe left them to do) and is retarded only by the univerſal remora of handſom deſigns, the want of a little dung-coloured earth. Truly I never found in myſelf ſuch ſtrong deſires for that adored muck, as now, that I ſee what gallant projects its affluence may promote. And I am apt to believe that a very juſtifiable avarice, that wiſhes not the poſſeſſion of riches, but the employment; and not ſo much for the pleaſure they may reap by it, as for the good they may do with it. But I muſt confeſs to you, that, in my wiſhes for the proſperity of your pious powder-plot, my private intereſts would needs mingle with more publick conſiderations, I having been lately ſo vexed by thoſe undermining two-legged moles, we call ſaltpeter-men, that my purſe, as well as my affection, makes vows for your ſucceſs. My pigeon-houſe they are already digging up, (an emblem of the practice of the times, in the ruin of unarmed innocence) and would have done the like to my cellar and ſtables, if I had not ranſomed them with a richer mineral than that they contain. I hoped my retreat to this ſolitude would have made me maſter of leiſure enough to entertain my own baniſhed thoughts, and perfect ſome lame diſcourſes I brought hither with me, to that purpoſe: but the neceſſary care of ordering my own ſmall mangled fortune, the unrulineſs of the troopers, my frequent journies, the allowed incendiaries (the ſaltpeter-men) and (to complete my diſaſters) the tedious, ſenſeleſs viſits of our country gentlemen, have ſo ſhared my hours amongſt them, that I find here as great a dearth of time, as there is of corn; and have now leſs of it at my own diſpoſal, than when I was fain to trifle it away with the ladies: and the plain truth of it is, that (betwixt the injuſtice of thoſe, that hold the civil ſword, and the unrulineſs of thoſe, that draw the martial) things are carried in ſo ſtrange a way in the *Weſt*, that theſe parts can afford little content or ſafety to any man, that is not either a ſoldier, a ſequeſtrator, or a committee-man. My grand employment, in my ſpare hours, is, to catechiſe my gardner and our ploughmen, concerning the fundamentals of their profeſſion; where I have fortuned upon ſome obſervations, that have perſuaded me into a paradox in huſbandry, as new as any of the religions minted in your heretical [*Coleman*] ſtreet. The opinion itſelf, together with the reaſons that led me to it, you ſhall hear of, God willing, by the next opportunity; I being extremely mindful of my promiſe, to tranſmit to you any thoughts or experiments of mine, that I ſhall judge conducible to the furtherance of your great deſign, and the enabling you to

do for the great world, what the chairmen of the phyſicians has done for the little, publiſh a diſcourſe *de uſu partium*. But leſt the tediouſneſs of this letter ſhould fright you from the lecture of thoſe others, that are deſtined to attend it, I will haſten to a concluſion; which though cuſtom enjoin me to make with a compliment, yet I am reſolved to continue ſo obſequious to our late decrees againſt that uſeleſs ceremony, that, to be ſure to keep far enough, not only from the guilt, but from the very ſuſpicion, of that crime, I will content myſelf with as naked, as true a profeſſion of my being very really,

SIR, *&c.*

London, Saturday morning.

SIR,

THE weakneſs of my eyes forbidding me to venture them, by candlelight, upon ſo ſmall a print, as that of the French book (of the Pere *Cherubin*) that you did me the favour to leave with me yeſternight, I could not, till late this morning, peruſe what he thought fit to write againſt my experiments, about the penetrability of glaſs with ſome finer parts of flame. I am more willing to paſs by, than imitate his dogmatical way of writing; and, in compliance with my preſent haſte, ſhall only conſider the ſubſtance of what he is pleaſed to object againſt my experiments.

I EXAMINE not what he ſuppoſes, about a violent extenſion of the air included in my ſealed retort, and that this ſtretched air has a ſtrong attractive power, to draw in the neighbouring air, when the *apex* of the glaſs was broken off; becauſe, though I do not acknowledge any ſuch attractive power in the air, yet I do not ſee how the ſuppoſition of that power will diſable my argument.

I THINK I may be pardoned, if I did omit the weighing the retort, and all that was in it, before I broke it; for I did not then know, that any body was like to make the exception the P. *Cherubin* has propoſed; and I thought it would be tedious to the reader, as well as to me, to ſet down all the imaginable objections, that could poſſibly be deviſed: and though this, that is made, had been actually ſuggeſted to me, only as a poſſible doubt, though not as the grand objection of a learned man, I ſhould yet perhaps have ſaved myſelf the labour of ſolicitouſly clearing it, becauſe, the circumſtances of the experiment ſeemed ſufficient to juſtify the concluſion inferred from it, as will by and by appear. And one, that were a ſceptick, and would have propoſed all the ſuſpicions, that might have been deviſed, would perhaps have acquieſced in ſuch a trial as my cenſurer declares would have ſatisfied him, becauſe of another jealouſy, that came into my mind, when I was converſant about the experiment. For, on this occaſion, I muſt let you know, for a certain reaſon, that needs not now be told, I remember I did weigh a ſealed retort, with matter in it, and found it encreaſed in weight, but thought not fit to lay much ſtreſs on that circumſtance.

As for the authority of Sir *K. Digby*, I am glad my cenſurer has ſo much deference for it; ſince that famous knight relates, that he had made quickſilver paſs in ſmall drops through glaſs itſelf; which, if true, will quite deſtroy P. *Cherubin*'s denial of the poroſity of glaſs: but, for a reaſon I have elſewhere declared, I will lay no weight on this; but ſhall conſider, wherein the ſtrength of the cenſurer's objection lyes; namely, that by Sir *K. Digby*'s experiments it appears, that calcined bodies do notably augment in ſubſtance, by the attraction they make of the air; to which I briefly anſwer, that if the P. were as well verſed in chemiſtry, as he is in opticks, he would not probably have looked upon this objection as irrefragable; for he will give one, that is a piece of a chemiſt, leave to tell him, that calcined bodies may be of very differing kinds, and that, though many of them, eſpecially vegetables, being calcined, do in time increaſe in weight, by the inſinuation made into the pores of their more ſaline parts, not by the ſimple air, but by the moiſt vapours that rove up and down in the air, and eaſily adhere to, and penetrate lixiviate ſalts; yet there are other calcined bodies, that are of a very different condition, ſuch as are the calces of metals, at leaſt of tin and lead; in which neither taſte, or for ought I have obſerved, any other means, has yet manifeſted a lixiviate ſalt, like that of burned vegetables. And therefore it need not ſeem ſtrange, that though calcined tartar, left in a moiſt air, will in time thereby be reſolved to a liquor, yet no ſuch thing will happen to the aſhes or calces of burned tin or lead; ſo that it is very improbable, that, in a few minutes, thoſe metals, though but partly calcined in my retorts, ſhould from air gain ſo great an increaſe of weight; eſpecially conſidering, that there is another manifeſt cauſe to be aſſigned for that increment, divers experiments purpoſely made having aſſured, that either of thoſe metals, being calcined, will make a notable acquiſt of weight upon the operation of the fire. And I opportunely remember, that this very year, having had occaſion to melt together, and ſteep for a pretty while in fuſion, a mixture of tin and copper, amounting in all to a pound (I ſay juſt, becauſe, though I dreamed not I ſhould make this uſe of the experiment, yet the uſe I did deſign required all things ſhould be very carefully weighed,) I found, that though a ſmall portion of the mixture was calcined, yet the total had gained in weight no leſs than 233 grains. And now, Sir, I am ſummoned to take leave of you and this paper, and want to renew and enlarge what I have ſcribbled; but perhaps what has been ſaid may keep it from being a preſumption in me to confeſs, that in the P. *Cherubin*'s objections, I have yet ſeen no reaſon to do what perhaps few are more diſpoſed

to do, alter my former opinions, his againſt them ſeeming to me to have more of confidence than ſtrength. I am in great haſte,

SIR, *&c.*

SIR,

IF your charity be not extraordinary, my want of civility will appear ſo to you, for having ſo long delayed acknowledging a favour, for which you might expect very early, as well as very affectionate thanks. But it will, perhaps, with ſo equitable and favourable a judge, paſs for ſome excuſe of my ſilence, if not for a juſtification of it, that your learned book came to my hands, when, being to make a journey into the Weſt, without knowing how long time, that, and my affairs in the country, would coſt me, I was obliged to diſpatch thither, before me, thoſe choicer books, that, in caſe my ſtay ſhould prove long, I thought likelieſt to keep it from being tedious. So that till, in my return, I came as far as this place, I had not an opportunity to enjoy the benefit of the welcome preſent you were pleaſed to make me. And ſince my return hither, the amanuenſis, whoſe hand the weakneſs of my eyes confines me to employ, has, upon an urgent occaſion, been unexpectedly kept abſent from me for above three weeks together; were it not for theſe impediments, Sir, I had much earlier expreſſed to you my great ſenſe of the honour and ſatisfaction I received in your excellent idea, which, though the unſettledneſs, which uſually, for a while, attends removes, have kept me from going ſo far through, as to be able to take a due proſpect of the concinnity of the work, and the tendency of the reſpective parts to the main deſign of the whole diſcourſe; yet in thoſe chapters I have had opportunity to peruſe, I have already met with divers things, that I have found no where elſe, and others ſo uncommmon, even among learned men, that though I do not much doubt but your ſeverity to the Romaniſts will, notwithſtanding your apology, procure you adverſaries enough; yet I as little doubt, that more diſintereſted readers will not judge, that, in this learned piece, the author's pen has degenerated from itſelf. If you ſhould tell me, that ſuch a work as this muſt be looked upon with much diſadvantage to it by him, that, ſeeing but a a portion of it, cannot ſufficiently diſcern the ſymmetry and connexion of the parts, I ſhall not contradict the allegation. But I hope I ſhall nevertheleſs be pardoned, if, having been unhappily reduced to ſuppreſs my reſentments ſo long, I take the firſt opportunity of declaring how much your merit and civilities have made me,

SIR,

your affectionate and

humble ſervant,

ROB. BOYLE.

WORTHY SIR,

I RECEIVED with a great deal of regret the ſad and ſurpriſing news, your letter brings me, of the deceaſe of ſo worthy and uſeful a perſon as doctor *Sall*, whoſe death I look upon, eſpecially at this juncture of time, as a great loſs, not only to thoſe, that knew him, but to the church of *Ireland* in general. But, together with that unwelcome news, you ſend me what does much alleviate the unwelcomneſs of it, when you acquaint me with your pious and generous reſolution, to proſecute the good work he was engaged in with the ſame Chriſtian aim (the glory of God, and the good of ſouls) which, I am confident, made him active in it. The nature of the work conſidered, I wholly agree with you, in thinking it unfit to deſpond of ſeeing it ſucceſsfully carried on, by his bleſſing, whoſe ſervice is aimed at in it. I look upon it as an auſpicious earneſt of good ſucceſs, that you are ſo zealouſly bent to promote it. I laſt week ſent poor doctor *Sall* notice, that I had procured the church catechiſm, with doctor *Marſhal*'s texts in the margin; and I am promiſed, within a week, a conveniency of ſending it you to *Dublin*. In the mean time I have laid by ſome money for the charge of the Iriſh grammar, that the diſpatch of that may receive no impediment that I can obviate. I intend alſo to be a further contributer than I have been towards the printing of the old teſtament, if there be any neceſſary occaſion for it; but I am ſorry I cannot yet procure the forms of ſubſcription, that were ſucceſsfully made uſe of, for the edition of the Welſh bible. I am promiſed them more ways than one, and, if I receive them, ſhall, God permitting, ſpeedily diſpatch them to you. But I do not well ſee, why thoſe, that are well affected to the work you have in hand, may not begin to do ſomewhat, whatever becomes of theſe patterns. The firſt ſheet of *Geneſis*, that you deſire, is already printed off, and, I preſume, on its way to *Dublin*, by the laſt poſt; Mr. *Reyley* having brought it ſome hours before that, went away, and having undertaken to diſpatch it that night, at the earneſt inſtance of,

Worthy Sir,

your moſt affectionate

[About April or May, 1682.] and moſt humble ſervant.

To the Counteſs of *Ranelagh*.

My dear SISTER,

IF I were of thoſe ſcribblers humour, who love to put themſelves to one trouble, to put their friends to another; and who weekly break their ſilence, only to acquaint us with their unwillingneſs to keep it; I muſt confeſs I had much oftner written you letters not worth the reading. But having ever looked upon

upon ſilence and reſpect as things as near of kin as importunity and affection, I elected rather to truſt your good opinion to your good-nature, than your patience with my letters: for which to ſuppoſe a welcome, muſt have preſumed a greater kindneſs, than they could have expreſt. For I am grown ſo perfect a villager, and live ſo removed, not only from the roads, but from the very by-paths of intelligence; that to entertain you with our country diſcourſe, would have extremely puzzled me, ſince your children have not the rickets nor the meaſles; and as for news, I could not have ſent you ſo much as that of my being well. To beſeech you not to forget me, were but a bad compliment to your conſtancy; and to tell you, I remember you, were a worſe to my own judgment: and compliments of the other nature it were not eaſy for me to write from *Stalbridge*; and leſs eaſy to write to you: ſo that wanting all themes and ſtrains, that might enable me to fill my letters with any thing, that might pay the patience of reading them, I thought it pardonabler to ſay nothing by a reſpectuous ſilence, than by idle words. But the cauſes being juſt ſo many excuſes of that ſilence, I ſhould have more need to apologize for my letters, if theſe ſeemed not neceſſary to prevent the miſconſtruction of their unfrequency; and if I did not ſend up the antidote with them, in the company of my brother *Frank*; by whom it were equally incongruous and unſeaſonable to ſend you no epiſtle, and to ſend you a long one; which (latter) that this may not prove, I muſt haſten to aſſure you, that though I have not very lately written you any common letters, it is not long ſince I was writing you a dedicatory one, which may (poſſibly) have the happineſs to convey your name to poſterity; and having told you this, I ſhall next take poſt to beſeech you to believe, that whenſoever you ſhall pleaſe to vouchſafe me the honour of your commands, my glad and exact obedience ſhall convince you, that though many others may oftner renew their bonds, I can eſteem myſelf, by a ſingle note under my hand, equally engaged to you for all the ſervices, that may become the relation, and juſtify the profeſſions, that ſtile me,

My dear ſiſter,

Stalbridge, this 13th Novem. your moſt affectionate brother, and faithful humble ſervant,

R. B.

To the Earl of *Corke* at *York*.

My deareſt BROTHER,

I THOUGHT I had a very juſt reaſon to quarrel with my ſickneſs, for debarring me the happineſs of waiting upon my ſiſter; but now I am willing to conſent to a reconciliation, ſince the enjoyment of her company muſt have had ſo ſhort a date, as would have ſerved but to have taught me the greatneſs of my loſs. For a late ordinance of parliament (which it ſeems is very ambitious of the honour of your companies) depriving all thoſe of the benefit of the articles of *Oxford*, and ranking them with the greateſt enemies of the ſtate, that ſhall not come hither to proſecute their compoſitions by the firſt of Auguſt next; does ſeem to exact your very ſpeedy repair to *London*, where your preſence will be very longingly expected by, and extremely welcome to,

Deareſt brother,

your moſt faithful, and humble ſervant,

London, this 14th July, 1646.

ROBERT BOYLE.

To the Counteſs of *Ranelagh*.

My deareſt SISTER,

I RECEIVED your letter with a huge deal of ſatisfaction, not only as an effect of your kindneſs, but an evidence of your recovery; which latter property more endeared your neat lines to me, than the former did; ſince the one relates to you, the other reflects only on myſelf; who muſt ever as much prefer the bleſſing of your happineſs, before the happineſs of your affection, as I value this latter above all other goods. I perceive by your intelligence, that we owe our condeſcenſions to our brethren, rather to our fear, than hatred of a war; and am very ſorry to find by your ſtory, that the faculties of our minds ſtand in ſo inverted a relation, that it is our paſſions, that bring us to reaſon, rather than we them. It is not alone upon the ſcore of its being ſo lately happened, that I eſteem that to be news, you are pleaſed to inform me, concerning the lords rejected motion to the commons, to have the lieutenancy of the *Tower* confirmed to the general, and the truſt of the kingdom's militia conferred upon him: for I imagine, that deſire of the lords to be a piece of great (to which epithet you will, perhaps, think it needleſs to add that of unuſual) diſcretion; for if (by miracle) the motion paſt, they had got the thanks of it; and their deſign being to have it thrown out, they could not deviſe a likelier way in order to that end, than to make it their motion: ſo that deriving a double advantage from a ſingle act, they gained Sir *Thomas Fairfax*'s affection, by ruining his buſineſs. The ordinance you mention againſt hereſies and blaſphemies appears to me a greater argument of your fright at *London*, than the buildings of that new officious houſe, ſo ominouſly and foreſeeingly erected by the members at *Weſtminſter*. But concerning this point of toleration, I may poſſibly, ere long, give you the trouble of peruſing my thoughts in an Eſſay, entitled, *of Divinity*. It ſeems, by

by what you relate of the under-hand treaty at *Chelſea*, that jugling is ſtill as much in faſhion with you amongſt the men, as painting is amongſt the women: and I am confident, that if the ſtatute againſt juglers and hocus-pocus blades were extended to ſtate affairs, and ſtrictly put in execution at this inſtant, ſome (nameleſs) places of very great reſort would be as perfect hermitages, as that your ſervant lives in. What all theſe confuſions will reſolve into at laſt, God only, that diſpoſes of events, (I think) does know: and from our knowledge, that he diſpoſes of them, we ought to derive our conſolation.

Now, for my own particular, I have been in perpetual motion ever ſince I laſt ſaw you; partly to comply with the neceſſity of my little domeſtick affairs, which exact my being active; and partly, by lawful recreations, to divert, as much as may be, that drowſy melancholy, which (beſides other croſſes) the fickleneſs of my health does daily endeavour to encreaſe. But, believe not my melancholy ſhall drive me to any diverſion, that may make me deſerve it: and for the knight's company you ſo ſeverely diſadviſe, I muſt aſſure you, that for this ſummer I am very unlike to have it; and at all times think my ſelf very much above the being perverted by it. But my preſent irreſolution, what courſe to take, makes me ſpare the now giving you any further trouble, than that of deſiring you, if you can, to get the diſpoſing of thoſe chambers at St. *James*'s reſpited, till you hear from me next poſt: by which I hope to give you a full account of his intentions, who, by this day fortnight, expects (God willing) the happineſs of aſſuring you, by word of mouth, how really he is,

My ſiſter,

Stalbridge,
May 13, 1648.

your moſt faithful, and humble ſervant.

MADAM,

WHEN I found a tranſcript of my letter encloſed in your ladyſhip's, the diſparity both of their ſtiles and contents obliged me to reſemble the whole pacquet to moſt of our young gallants, and their clothes; where the covering is ſo much better than that which it enfolds: for ſeriouſly, Madam, I was extremely aſhamed to find, that I had put your ladyſhip to the trouble of a copy of my laſt dull ſcribble, ſince I deſired the return of the original, not more to ſatisfy (or rather diſabuſe) the young gentleman's curioſity, than to aboliſh ſo tedious an inſtance of my bad ſecretaryſhip. The intelligence here is both leſs and worſe, than poſſibly your ladyſhip's expectation preſumes; the Kentiſh buſineſs has hurt us no otherwiſe, than by making us fear, that it might do ſo. Victory is as obedient, as the very parliament to the army: my laſt week's aſtrology has not at all deceived me; and though ſince that time divers ſucceſſes of the Kentiſh men have extremely frowned upon my predictions; yet the event has very much conformed to my conjectures; the Kentiſh being almoſt wholly reduced to the diſcretion of the parliament; who, it is thought, will, in this nice particular, more conſult the laws of policy, than thoſe of charity.

THE Eſſex men had yeſternight granted them an act of indemnity; which is like to attempt *Bow* bridge with much better ſucceſs than they ſay our forces have had there. The Surrey men ſeem, by the fate of their companions, deterred from enterpriſing any novelty; and, after all their threatenings, and complaints, ſeem content, with putting this compliment upon their patience, to let the world know, that they ignore not the extent and the dimenſions of the wrongs, that they forgive. My lord of *Warwick* was pleaſed to give me a very full account with his own mouth, of his whole negotiation with the fleet: but the printed paper will be ſo ſure to relate, at leaſt as much as is true of that tranſaction, that I ſhall purpoſely decline it: he is now gone to *Portſmouth*, with the ſhipping he finds there, to endeavour the reducing of thoſe ſix ſhips, that ſhow themſelves refractory; of which he aſſured me ſecretly at his departure, that the officers of four were at his devotion. I ſupped laſt night at *Warwick* houſe, with my lady's daughters only; and find by their ſtory, that *Charles Rich* is the grand agitator in this Eſſex buſineſs. One of our maſters told me this afternoon at *Weſtminſter*, that they had voted the propoſitions to be treated on with the king, the ſame that were preſented him at *Hampton* court, to be ſent away immediately to the *Scots*, for their concurrence, with a deſire, that they ſend ſuch further particular addreſſes to his majeſty, as they have reſolved on, in order to their own nation's peculiar intereſt. Our brethren are not like to viſit us ſo ſoon as we expected; but our diverſion in theſe parts of the kingdom hath, as it is boaſted, given the royaliſts the liberty of a quiet, and almoſt undiſturbed encreaſe in the North. The diſobedient ſhips have choſen for their admiral, one major *Kemb*, a miniſter, and a mad witty fellow, whom I have ſometimes been very merry with; his wife being ſiſter to that honeſt red-noſed blade, that waits now upon me. But a perſon of quality, and one, that pretends to be no petty cabaliſt, gave me the honour of a viſit this morning, and aſſured me, that he knew from both parties the probability of a ſpeedy peace to be ſo great, that it is expected even by thoſe perſons, by whom it is not wiſhed for. But, Madam, ſince I began to write this letter, I had unexpectedly the happineſs of a long converſation with the fair lady, that people are pleaſed to think my miſtreſs; and truly, Madam, though I am as far from being in love, as moſt that are ſo are from being wiſe, yet my haſte makes me gladly embrace the old excuſe of,

Then

Then to ſpeak ſenſe,
Were an offence;

to extenuate my having hitherto written ſo dully, and my concluding ſo abruptly; for whilſt this amorous rapture does poſſeſs, I neither could write ſenſe without being injurious to my paſſion, nor can any longer continue to write nonſenſe, without ſome violation of that profound reſpect, which is both due to you from, and vowed you by,

Madam,

London, June 6, 1648. your ladyſhip's moſt faithful, and moſt humble ſervant.

[To Mrs. *Huſſey*.]

To the Counteſs of *Monmouth*, at *Moore-Park*.

MADAM,

IN your ladyſhip's (imparted to me by my ſiſter *Ranelagh*) I find myſelf ſo confounded with civilities, that if ſhe, that bleſſed me with the ſight of your letter, had not (for her own diſcharge) exacted of me this acknowledgment of my having ſeen it; I muſt confeſs, I ſhould ſcarce have ventured to return a verbal anſwer; deterred by the impoſſibility of writing without wronging a reſentment, which I can expreſs as little, as I deſerved the praiſes and the favours, that have produced it. To be commended by your ladyſhip, and that for ſuch a quality as that, which you are pleaſed to think my deſires give me a title to, would poſſibly both create pride in me, and (in ſome ſort) excuſe it; if I did not conſider myſelf extolled for an attribute, which owes more of its price to its rareneſs, than its value; and argues much more the degenerateneſs of thoſe young men, that want it, than any great virtue in them, that do poſſeſs it; that earlineſs of piety, which is made my merit, being ſo much my duty, that it is the faults of others, that muſt make it my commendation. As for my pamphlet, madam, had it expected the glory of entertaining you, it ſhould certainly have appeared in a leſs careleſs dreſs; but, madam, though after your ladyſhip's approbation, to doubt a general one, were to believe the latter not worth the caring for; yet my juſt ſenſe of the ſmalneſs of the acceſſion the preſs can be to the honour of your ladyſhip's peruſal, makes me decline its publication. And as that paper cannot have either a higher applauſe or nobler end, than the being liked and practiſed at *Moore-Park*; ſo if it have either any way diverted your ladyſhip, or had the leaſt influence upon my lord, I have reached my deſires, and gone beyond my hopes. However, madam, I am richly rewarded for writing ſuch a book, by being enjoined to fetch it where you are. So welcome a command is very unlikely to be diſobeyed: but my obedience, madam, muſt be payed to the order, not the motive: the fetching of my book may be one effect of my remove, but not the errand of it; for ſure, madam, your modeſty cannot be ſo injurious, both to yourſelf and me, as to perſuade you, that any inferior, (that is, other) motive, can be looked upon by me as an invitation to a journey, which will bleſs me with ſo great a happineſs, as that of your ladyſhip's converſation; and give me the opportunities of aſſuring you better than my preſent haſte and my diſorder will now permit me, in how tranſcendent a degree, I am, madam,

Your ladyſhip's humble

London, this 7th of July, 48. and obliged ſervant,

ROBERT BOYLE.

MY SISTER,

I HAVE ever counted it amongſt the higheſt infelicities of friendſhip, that it encreaſingly reflects upon us our imparted griefs; for if our friends appear unconcerned in them, that indifference offends us, and if they reſent them, ſympathy afflicts us. This conſideration concurring with my native diſpoſition, has made me ſhy of diſcloſing my afflictions, where I could not expect their redreſs; being too proud to ſeek a relief in the being thought to need it, and too good a friend to find a ſatisfaction in their griefs I love, or to admit of the ill natured conſolation of ſeeing others wretched as well as I. This humour may in part inform you of the cauſe of my ſilence, and, I hope, in part excuſe it. But I am not now at leiſure to make apologies, though I will aſſure you I decline the employment for want of time, not juſtice. Since I wrote to you laſt, I was unlikely enough ever to be in a condition to write to you again; and my danger was ſo ſudden and unexpected, that nothing could tranſcend it, except theirs, whoſe dilatory converſion makes them truſt eternity to the uncertain improvement of a future contingent minute of a life obnoxious to numerous caſualties, as impoſſible (almoſt) to be numbered as avoided. What God has decreed of me, himſelf beſt knows; for my part I ſhall ſtill pray for a perfect reſignation to his bleſſed will, and a reſembling acquieſcence in it; and I hope his ſpirit will ſo conform me to his diſpenſations, that I may cheerfully, by his aſſignment, either continue my work, or aſcend to receive my wages. And in this I muſt implore the aſſiſtance of your fervent prayers, dear ſiſter, which I am confident will both find a ſhorter way to heaven, and be better welcomed there. Theſe three or four weeks I have been troubled with the viſits of a quotidian ague, which yet had not the power to hinder me from three or four journeys to ſerve *Frank*, and

and wait upon my dear *Broghill*, nor from continuing my Vulcanian feat; and in the intervals of my fits, I both began and made ſome progreſs in the promiſed diſcourſe of *publick ſpiritedneſs*: but now truly weakneſs, and the doctor's preſcriptions, have caſt my pen into the fire; though in ſpite of their menaces, I ſometimes preſume to ſnatch it out a while, and blot ſome paper with it. My preſent employment is the reviewing ſome conſolatory thoughts on the loſs of friends, which my poor lady *Suſan*'s death obliged me to entertain myſelf with, and which I am now recruiting. If ever I finiſh them, I ſhall trouble you to read them, and if I do not, beſeech you to make uſe of them. The melancholy, which ſome have been pleaſed to miſrepreſent to you as the cauſe of my diſtempers, is certainly much more the effect of them; neither is it either of that quality, or that degree you apprehend, but much more juſt than dangerous. Yet to obey you, I ſhall endeavour a divorce; and as the propereſt means, endeavour to wait upon you: in order to which I came this night in a litter to this town, whence I intend not to diſlodge, till God's bleſſing upon the remedies enable me to do it on horſeback. The kindneſs you expreſs in the letter I received this morning, has brought me ſo high a conſolation, that I ſhould think it cheaply purchaſed by the occaſion of it, if I had ignored, that the ſole want of ſuitable opportunities reſtrained the frequency of reſembling ſtrains; and if I were not too well acquainted with the greatneſs of your goodneſs, not to derive a higher joy from your obliging proffers, as they are effects of your friendſhip than teſtimonies of it. But though I value the bleſſing of your company at the rate of having the happineſs of more than an indifferent acquaintance with you; I cannot conſent to purchaſe my felicity (if ſuch a thing could be done) by your diſquiet: for your remove will not more certainly diſcompoſe your family, than it will be uſeleſs or unneceſſary to me; the nature of my diſeaſe being ſuch, that it will either fruſtrate your viſit, or allow me to do ſo. For, if in a very ſhort time it deſtroy not, it will leave me ſtrength enough to fetch a perfecter cure of it at *London*, whither in ſpite of my preſent diſtempers, which are not ſmall, nor (I fear) very fugitive, the phyſicians would perſuade me, that by God's aſſiſtance I may be able to crawl in a ſhort time. I ſhall beſeech you therefore not to ſtir, until you hear further either from me, or of me; and to believe, that though your viſits are favours of too precious a quality to be fully receivable from your intention only, yet my concern in your quiet will make me (in the purpoſed journey) more welcomely reſent your deſign than your preſence. I hope you will pardon the diſorder of this ſcribble to that of the writer, who is not only weary of his journey, but is at preſent troubled with the fit of his ague, which yet being but a ſickneſs, cannot impair an affection, which will be ſure to keep me really and unalterably till death,

My deareſt, deareſt, deareſt ſiſter,

your moſt affectionate brother,

Bath, Aug. 2, 1649. late at night. and humble ſervant,

R. B.

MY SISTER,

I MUST confeſs, that I ſhould be as much in your debt for letters, though I had anſwered every one of yours, as he is in his creditor's, who for two angels has paid back but two ſhillings. For certainly, if any where, it is in the productions of the mind, that the quality ought to meaſure extent, and aſſign number; and equity to multiply excellency, where wit has contracted it. I could eaſily evince this truth, and the juſtneſs of the application too, did I not apprehend, that your modeſty would make you mind me, that the nature of my diſeaſe forbids all ſtrains. I am here, God be praiſed, upon the mending hand, though not yet exempted either from pain or fears; the latter of which I could wiſh (but believe not) as much enemies to my reaſon, as I find the former to my quiet. I intend notwithſtanding, by God's bleſſing, as ſoon as I have here recruited and refreſhed my purſe and ſelf, to accompliſh my deſigned removal to *London*; my hoped arrival at which, I look on with more joy, as a fruit of my recovery, than a teſtimony of it. *Sir William* and his ſon went hence this morning, having by the favour (or rather charity) of a viſit, made me ſome compenſation for the many I have lately received from perſons, whoſe viſitations (I think I may call them) in ſpite of my averſeneſs to phyſick, make me find a greater trouble in the congratulations, than the inſtruments of my recovery. You will pardon, perhaps, the bitterneſs of this expreſſion, when I have told you, that having ſpent moſt of this week in drawing (for my particular uſe) a quinteſſence of wormwood, thoſe diſturbers of my work might eaſily ſhake ſome few drops into my ink. I will not now preſume to entertain you with thoſe moral ſpeculations, with which my chemical practices have entertained me; but if this laſt ſickneſs had not diverted me, I had before this preſented you with a diſcourſe (which my vanity made me hope would not have diſpleaſed you) of the theological uſe of natural philoſophy, endeavouring to make the contemplation of the creatures contributory to the inſtruction of the prince, and to the glory of the author of them. But my blood has ſo thickned my ink, that I cannot yet make it run; and my thoughts of improving the creatures have been very much diſplaced by thoſe of leaveing them. Nor has my diſeaſe been more

guilty

guilty of my oblivion, than my employment ſince it has begun to releaſe me; for Vulcan has ſo tranſported and bewitched me, that as the delights I taſte in it, make me fancy my laboratory a kind of Elyſium; ſo as if the threſhold of it poſſeſſed the quality the poets aſcribed to that *Lethe*, their fictions made men taſte of before their entrance into thoſe ſeats of bliſs, I there forget my ſtandiſh and my books, and almoſt all things, but the unchangeable reſolution I have made of continuing till death,

Stalbr. Aug. the laſt, 1649. Siſter, your

R. B.

To Lord *Broghill.*

My deareſt Governor,

I RECEIVE in our ſeparation as much of happineſs as is conſiſtent with it, in hearing of you in ſo glorious, and from you in ſo obliging a way; and in being aſſured by your letters and your actions, how true you are to your friendſhip and your gallantry. I am not a little ſatisfied, to find, that ſince you were reduced to leave your *Partheniſſa*, your ſucceſſes have ſo happily emulated or continued the ſtory of *Artabanes*; and that you have now given romances as well credit as reputation. Nor am I moderately pleaſed, to ſee you as good at reducing towns in *Munſter*, as *Aſſyria*; and to find your eloquence as prevalent with maſters of garriſons, as miſtreſſes of hearts; for I eſteem the former both much the difficulter conqueſt, and more the uſefuller. Another may lawfully exalt your bold attempts and fortunate enterprizes; but, for my part, I think, that ſuch a celebration would extremely miſbecome a friendſhip, to which your goodneſs and my affection flatter me into a belief, that our relation has rather given the occaſion, than degree. Beſides that I have ſo great a concern in all things, wherein you have any, that the preſumption of my own modeſty does, as well as the greatneſs of yours, ſilence my praiſes. And, truly, that, which moſt endears your acquiſitions to me is that they have coſt you ſo little blood. For beſides, that the glory is much more your own to reduce places, by your own ſingle virtue, and the intereſt it has acquired you, than if you had I know not how many thouſand men to help you, and ſhare as much the honour of your ſucceſſes, as they contribute to them; beſides this conſideration, I ſay, certainly, though a laurel crown were more glorious amongſt the Romans, the myrtle coronet (that crowned bloodleſs victories) ought to be acceptabler to a Chriſtian, who is tied by the bindingeſt principles of his religion, to a peculiar charity towards thoſe that profeſs it; to uſe towards delinquents as much gentleneſs, as infringes not the juſt rights of the innocent; and to be very tender of ſpilling their blood, for whom Chriſt ſhed his. But I am leſs delighted to learn your ſucceſſes in the world, than to find (by your letter to my ſiſter *Ranelagh*) that you mean not they ſhall tie you to it; and are reſolved, as ſoon as your affairs and reputation will permit you, to diveſt your publick employment, and retire to a quiet privacy, where you may enjoy yourſelf, and have leiſure to conſider the vanity of that poſthume glory, which has nothing in it of certain, but the uſeleſneſs. That, in that hurry of buſineſſes, that diſtracts you, you could find leiſure to bleſs me with your letters, is a favour, which, though it amaze me not, does highly ſatisfy me. The kindneſs they expreſs is welcomer to me, for what it argues, than for what it promiſes; and I am much more pleaſed, to ſee you in a condition of making promiſes, than I ſhould be with their accompliſhment. I ſhall only in general deſire your countenance for thoſe, that manage my fortune in your province, whither I ſhould wait upon my deareſt lady *M.* if black *Betty* did not; and, ſeriouſly, the jade arrived very ſeaſonably, to ſave me a journey, for which I was but ſlenderly provided; for having not yet been able to put off my L. *Goring*'s ſtatute, I am kept in this town, to do penance for my tranſgreſſions of that precept, *my ſon, put money in thy purſe.* But the term aſſigned my expiation is, I hope, near expired; and I deſpair not to ſee myſelf ſhortly in a condition to make you a viſit, that ſhall prevent the ſprings. I ſhall implore, for my lady *Pegg*, the ſelf-ſame paſſage I ſhall wiſh for myſelf, and ſolemnize the firſt eaſterly gale with a

Farewel, fair ſaint, may not the ſeas and wind, &c.

But I am ſo entirely taken up with the contemplation of her and you, that I had forgot, that I have to write this night more letters than the four and twenty of the alphabet. My next ſhall give you an account of my tranſactions, my ſtudies, and my amours; of the latter of which black *Betty* will tell you as many lies as circumſtances; but hope you know too well what ſhe is, and whence ſhe comes, not to take all her ſtories for fictions, almoſt as great as is the truth, that ſtiles me,

My deareſt brother,

your moſt affectionate brother

London, this 20th of Dec. 1649. and humble ſervant,

ROBERT BOYLE.

THOUGH I count it no ſmall happineſs to enjoy the long-forbidden liberty of writing to you; yet, after almoſt ten years of ſeparation, and more than almoſt as long a ſorrow for it, to find myſelf ſtill withheld from a more ſatisfying and immediate converſation with you, than that of letters (by a detention here as tedious as neceſſary) is an affliction, that it is not eaſy, moderately to reſent. For being as confident as deſirous to be able to wait upon you, in my lady *Broghill*'s company, as ſoon as our reſidences ſhould loſe their

their antipathy, I am, both contrary to my expectation and intereſt, by unforeſeen and dilatory accidents, unhappily kept here, and condemned to renounce ſo fair an opportunity, as that, which my ſiſter *Broghill*'s remove, and invitations to attend her in it, preſent me, by a confinement ſo unwelcome, that nothing more troubles me in my ſtay here, than that it hinders me from ſtirring hence. But I deſpair not, by the diſpatch of thoſe affairs, that by an indiſpenſable neceſſity impriſon me in this place, to procure a ſudden releaſe; which yet, though it ſhould prevent my hopes, will appear ſlow to my deſires; which cannot but be more than moderately eager, to review my native country, endeared by your preſence, and my fourteen years abſence. I know *Frank* will endeavour to perſuade you, that it is the thing called love, that keeps me here: but truly I have ever kept that paſſion obſequious, not only to my reaſon, but my intereſt; beſides that I ſhould very willingly do you the injury of being kept from you by any of your ſex. The occaſional mention I have made of miſtreſſes, brings into my memory, that I have been deſired to ſay ſomething to you, concerning my L. of *Barrimore*'s late marriage. That I neither contributed to it, nor ſo much as knew of it, I think you cannot ignore; and that, if I had known of it, I ſhould not have contributed to it, my humour will, perhaps, incline you to believe. I ever paid too religious an obedience to my own parents, to perſuade or juſtify the contrary practice. And therefore, without pretending to excuſe or extenuate what is paſt, having minded you, that there is a difference betwixt ſeaſonable and juſt, I ſhall venture only to repreſent to you, that the queſtion is not now, whether or no the marriage be a thing fit to be done, but how it is to be ſuffered: and that, as the beſt gameſters have not the privilege of chuſing their own cards, but their ſkill conſiſts in well playing the game, that is dealt them; ſo the diſcreeteſt perſons are not allowed the choice of conditions and events, but their wiſdom conſiſts, in making the beſt of thoſe accidents, that providence is pleaſed to diſpenſe them. This being preſuppoſed, I ſhall beg you to conſider, whether, after ſo powerful a mediation, as that of a crowned interceſſor, very paſſionate and laſting (though never ſo juſt) reſentments may not prejudice you with that party, for which you have openly declared, and which alone you can have unflattering expectations from: and whether, or no, in things paſt remedy, it be not better, rather, by a winning gentleneſs, to improve what you diſlike, to its beſt uſes, and forgive a fault, you have already ſhewn yourſelf, and made him ſenſible of, than perſiſt in teſtifying an implacable indignation, that cannot redreſs a diſpleaſure, and may provoke one. I know you are wiſe enough to be your own counſellor, and that you want neither thoſe abilities, that fit us to diſcern reaſon, nor thoſe inclinations to diſpoſe us to acquieſce in it. Nor is it to adviſe you, that I have aſſumed this freedom, but only to ſatisfy the deſires of ſome of your neareſt friends; who, though they think the match very unhappy, think it unfit the married pair ſhould be ſo. I hope, by the end of *February*, to juſtify theſe conſiderations, or beg your pardon for them at *Caſtle-lyons*. And if, in the mean time, you will vouchſafe to let me know, in what my ſtay here may not be uſeleſs to you, I ſhall think myſelf happy in the opportunities of letting you ſee, that I am as much more willing, as more fit to ſerve you, than to counſel you; and that it is by my obedience, that I am chiefly ambitious to evince myſelf,

My dear ſiſter,

Lond. this 21ſt of Dec. 49.

your moſt affectionate, moſt faithful, and moſt humble ſervant,

ROBERT BOYLE.

THOUGH I received ſo early the ſad account of my deareſt brother's ſickneſs, accompanied with ill preſaging circumſtances, that I could not but doubt it would prove his laſt, and ſo had time to prepare myſelf for the worſt; yet now, that my fear is turned into certainty, I find, that though the warning I had kept me from being ſurpriſed, it cannot keep me from being ſo afflicted and diſcompoſed, that I am much more fit to keep you company in your ſadneſs, than endeavour to cure you of it. And therefore, knowing that I can offer you no conſolations ſo pertinent and weighty as you may ſupply yourſelf with, out of your own ſtock of reaſon and religion, I ſhall not trouble you with a long letter; but only name to you two or three of thoſe conſiderations, that my own experience moſt recommends to me, in our common loſs. Under ſo great a one, the chief thing I can pitch upon, to quiet my troubled mind, is, the conſideration of that hand, from which this heavy ſtroke comes; for God, who is infinitely wiſe and good, as well as abſolute, has a much greater right of propriety in our relations, than we ourſelves have, they being but our friends, or kindred; whereas he is their creator, preſerver, benefactor, and owner; and, upon all theſe titles, has a right to diſpoſe of them, as may beſt conduce to his purpoſes; eſpecially ſince the ſame courſe, by which he brings them to contribute to his glory, brings them to be the earlier partakers of it. Another thing, which has much impreſſion on me, is, the remembrance of thoſe great torments and bodily infirmities, that have, for divers years, made my dear brother's life very uneaſy to him. This none knows better than yourſelf, whoſe extraordinary kindneſs have made you acquainted with it, ſo much to your toil and trouble; ſo that, in a perſon, that lived in ſo much pain, and died with ſo much willingneſs,

neſs, a pious end ought not to be lamented by us, otherwiſe than upon our own account; eſpecially ſince God, by vouchſafing him ſome years of retirement from the noiſe and hurry of the world, gave him leiſure and opportunity to ſet his mind and houſe in order againſt the arrival of his great change. Theſe and the like conſiderations do much contribute to call my thoughts, under this ſharp trial, as it relates perſonally to him, ſo that much of my ſorrow does, I confeſs, proceed from my own private loſs of ſo excellent a brother and a friend; and from the ſenſe I have of the general miſs, that the poor country he lived in will find of him, and the particular loſs ſuſtained by his afflicted family, and eſpecially by you, my dear ſiſter, who, being now, in a more ſtrict ſenſe than before, the great ſupport, ornament, and comfort of it, I humbly beſeech you, to contribute all you can, to preſerve ſo great a bleſſing to it; not ſo remembring, that you were a wife, as to forget, that you are a Chriſtian and a mother; and as you have exemplarily performed the utmoſt of what the firſt relation could require of you, ſo I hope and beg you will now apply your ſelf to what the two other relations exact; both ſtrive to moderate your grief, and take great care of a health, which your kindneſs has made you too much, and, I fear, too long neglect; and for the recovery of which, a great many, beſides your own family, are not a little concerned; but none more heartily and juſtly than,

Madam, your ladyſhip's, *&c.*

I beg to be repreſented as a moſt humble ſervant to all your diſconſolate children, whoſe pardon I beg, for not being able to write to them in particular, upon ſo ſad an occaſion, which allows me not enough either of leiſure, or freedom of thoughts, for ſuch an employment. I wiſh my lord of *Orrery* much joy of his new title, and that he may ſucceed his father, as well in better things, as in that. Having been of late not well myſelf, I have made no viſits, but one to my brother *Burlington*, who kept his bed for the gout, and one to each of your daughters, whom I found (to day) as I expected, extremely troubled at their great loſs: but I hope that exceſs of ſorrow, that threatned their health, is ſo far moderated, that it will not now prove at all dangerous.

[To the Counteſs of *Orrery* on the Earl s death, in *October* 1679.]

To the Lady *Orrery*.

London, Nov. 28, 1682.

I LITTLE thought, my dear ſiſter, that ſo ſoon after I had ſent you a congratulating letter about my poor lady *Donegal*, I ſhould have occaſion to write you a condoling one, upon her account. But it is partly our fault, as well as our unhappineſs, if we ſo far forget the inſtability, that human proſperity is ſubject to, as to be much ſurpriſed, when we do not find it laſting. You have been of late years ſo accuſtomed to the loſs of friends, that it may reaſonably be ſuppoſed, that ſo much experience has not more exerciſed your patience, than confirmed it. And the ſeveral accidents of this kind, you have been ſubject to, would have put a perſon, far leſs pious and conſiderate, upon reflections, that doubtleſs would anticipate, what I could offer to you by way of conſolation; which therefore I ſhall forbear to trouble you with: only I cannot leave unmentioned this, that is a great one to your friends and ſervants here, that they find, by a letter from ſo authentick a hand as my lord primate's, that though the perſon we lament died young and early, ſhe did not die ſurpriſed, nor unprepared; his grace giving ſuch an account of her behaviour, during her ſickneſs, and eſpecially in the laſt ſad ſcene of it, as forbids us to grieve for her, but only for ourſelves, and for you; to whom a divine ſupport, and a ſanctified uſe of this affliction, is heartily wiſhed, by a ſharer with you in it, that begs the juſtice to be eſteemed,

Madam,

your ladyſhip's moſt humble,

moſt faithful and moſt

affectionate ſervant.

To Mr. *Clodius*.

SIR,

AS I could not ſupport the conſtancy of your ſilence but with a huge deal of uneaſineſs, ſo I receive not the honour of your letters, but with as much of joy. And indeed they are ſo obliging and inſtructive, that their philoſophy and their kindneſs do as well diſtract as deſerve my gratitude. I am little leſs than tranſported to find myſelf to have ſo great an intereſt in a perſon, that hath ſo great an intereſt in philoſophy; and in the ſame packet, in which I am aſſured by others of the ſublimity of your knowledge, to be aſſured by yourſelf of the conſtancy of your condeſcenſions and friendſhip. For the proceſſes you are pleaſed to ſend me of Mercurius vitæ, I return you my moſt humble thanks, and am extremely aſhamed to be able to return you little elſe; and that our commerce is ſo unequal, that I am almoſt confined but to receive what you ſo freely communicate. For alas! beſides, that though our opportunities and accommodations to improve our time were equal, the vaſt diſproportion of our intellectuals would keep me ſtill your diſciple; beſides that, I ſay, I live here in a barbarous country, where chemical ſpirits are ſo miſunderſtood, and chemical inſtruments ſo unprocurable, that it is hard to have any hermetick thoughts in it, and impoſſible to bring them to experiment: yet to ſhew at leaſt a willingneſs to acknowledge the favour

of your antimonial preparations, I here encloſe you the proceſſes of the ſulphur of ſtella Martis, which you were pleaſed to deſire of me at our parting; and of the two proceſſes (from the ſame hand) the larger is the recenter, and ſeems the better. I might tell you of ſtrange matters this ſulphur has done in agues (even in quartans) and fevers; but I confeſs I look upon it but as a trifle in compariſon of the laudanum, the cinnabar, the drif, the ens Veneris ſaccharinum, and thoſe other higher arcana, which you, have either perfected or ſet about. And give me leave to tell you, that it is no weak evincement of my paſſion for and concern in your happineſs, that I can refrain envying you, whilſt every packet almoſt brings me the news of the great things you, do and are undertaking; whilſt unhappy I am condemned to lead an uſeleſs life, in a country, where I can ſcarce get time to think of chemiſtry, much leſs opportunities to improve it. And certainly a detention here, that ſeparates me from Mr. *Clodius*, and ſo adds the pœna damni to the pœna ſenſus, would overpreſs my conſtancy, if I did not hope, that my ſtay in *Ireland* cannot be ſo long, as I know ſo great a diſtance from you will make me find it tedious; and if I did not alſo hope, that by a ſhort and neceſſary ſtay, to ſettle my affairs in this country, I may put myſelf in a condition of living out of it, and proſecute more undiſtractedly and effectually the ſtudy of real learning. You are extremely obliging in the tender ſenſe you expreſs of my yet continuing diſtempers, and no leſs my friend in the advice you give me to leave this unlucky country, and ſeek, under God, for a cure in a place, where you are pleaſed to offer me two things ſo conducive to my recovery, as your remedies and your converſation. And would to God, deareſt friend, my affairs were as ready for ſuch a journey as my inclinations: how would I fly to ſee the wonders I hear of, and enjoy that much wanted ſociety you were once pleaſed to vouchſafe, and are ſtill ſo free to offer me. But honeſt Mr. *Hartlib* can inform you of the neceſſity of my ſtay here till the 24th of June be paſt; and of my unfitneſs till then to obey thoſe inclinations, that would inceſſantly carry one towards you. But as ſoon as the 24th of June is well paſt, I intend, if God bleſs me with life and health, to be either in *England*, or waiting for the firſt conveniency of tranſportation thither. Till then, a juſt impatience will extremely diſquiet me, if you be not ſo charitable as to vouchſafe me ſome of your converſation by letters, (whoſe length and frequency will moſt endear them:) and ſince this is the ſeaſon of the year, in which my diſtempers uſe moſt to infeſt me, you would very ſenſibly oblige me, if you have already prepared any of the medicines your letter mentions, to ſend me by the very firſt ſafe conveniency, as much as you ſhall think fit for my preſent perſonal uſe, with ſome directions how to take what you ſend. For my part, that I may not live wholly uſeleſs, or altogether a ſtranger in the ſtudy of nature, ſince I want glaſſes and furnaces to make a chemical analyſis of inanimate bodies, I am exerciſing myſelf in making anatomical diſſections of living animals: wherein (being aſſiſted by your father-in-law's ingenious friend Dr. *Petty*, our general's phyſician) I have ſatisfied myſelf of the circulation of the blood, and the (freſhly diſcovered and hardly diſcoverable) receptaculum chyli, made by the confluence of the venæ lacteæ; and have ſeen (eſpecially in the diſſections of fiſhes) more of the variety and contrivances of nature, and the majeſty and wiſdom of her author, than all the books I ever read in my life could give me convincing notions of. Deſigning, whilſt I am kept priſoner in *Ireland*, to proſecute that ſtudy, as I have opportunity; if there be any thing relating to it, wherein my knives may give you any ſatisfaction, I ſhall be very proud to employ them to ſo elevated an end. I have not been all this while unmindful of the commands, wherewith you were pleaſed to honour me, when I laſt kiſſed your hands, to enquire into the mineral advantages of *Ireland*: but in this illiterate country, I found all men ſo perfect ſtrangers to matters of that nature, that my enquiries have hitherto been as fruitleſs as diligent. But ſince my coming to this town, my endeavours have procured me ſome little information, and hopes of more. Of the ludus, that Dr. *Currer* had, I can yet learn nothing, nor yet of any mine of antimony. But for iron, I may be able to give you a good account of it, and to bring you over of the ore; my eldeſt brother having upon his land an iron work, that now yields him a good revenue; and I having upon my own land an iron mine, to which before the wars belonged a (ſince ruined) work, which I have thoughts of reſetting up. I am likewiſe told (but how truly, I know not yet) of a little ſilver mine lying in ſome land of mine; and very lately in a place, which belongs to a brother of mine, they have found ſilver ore very rich; for being tried, it is eſtimated, (as he tells me, that means to deal for it) at between 30 and 40 pounds a ton: but whether or no there be a mine of proportionable value, we do not yet know. I was yeſterday with an officer of the army, who farms a ſilver mine from the ſtate, who hath promiſed me what aſſiſtance he can in my mineral enquiries, and told me, that a metalliſt and refiner, whom he extolled with ſuperlative elogies, aſſured him, that there was no country in *Europe* ſo rich in mines as *Ireland*, had but the inhabitants the induſtry to ſeek them, and the ſkill to know them. If I ſhall in relation to this matter, or to any other, wherein my ſtay here may be any ways improveable to your ſervice, be honoured with any further or more particular inſtructions, I ſhall (God willing) by my forwardneſs to obey them, endeavour to manifeſt, that I am as highly as juſtly ambitious not to utter uſeleſsly the title of Mr. *Clodius*'s

Moſt affectionate friend, and
moſt obliged humble ſervant,
ROBERT BOYLE.

MY

May 27, 1662.

MY LORD,

YOU will not, I preſume, think my ſilence ſtrange, when I ſhall have acquainted your lordſhip, that the reaſons of it have been partly, that I was informed, that the parliament of *Ireland* had adjourned itſelf for a long time, and partly becauſe an honeſt gentleman of publick employments, and very well verſed in the affairs of that country, did ſome days after your lordſhip's departure hence, undertake to procure me, with all convenient ſpeed, an account, how thoſe impropriations, which are within the grant made me by his majeſty are, or are like to be, provided of miniſters and maintenance. And though the procuring me this account would, I knew, require ſome time; yet the requiſiteneſs of it to aſſiſt me how to order myſelf on this unhappy occaſion, made me unwilling to write to your lordſhip, till I had received it, and the adjournment of the parliament made me hope I might receive it ſeaſonably enough: but being ſurpriſed ſince the laſt poſt with the news of the parliament's being met again, and of the quick progreſs, that is making in the act for the ſettlements of *Ireland*; the promiſe I made your lordſhip at our ſeparation, forbids me to delay to ſay ſomething to you about the buſineſs we then diſcourſed of, but it is now too late at night, that I muſt not till a fitter opportunity enlarge upon particulars, but muſt make haſte to inform your lordſhip, that having, as I told you I intended, applied myſelf to that excellent prelate the biſhop of *Lincoln*, for his advice on ſo nice an occaſion, I came upon the whole matter to this reſult, that the king's grant made to me having preceded both the grant made in the act to the church, and even the church's application to his majeſty for that grant, I might juſtly challenge the impropriations mentioned in my proviſo. (For as for the reference made by the king on the convention's addreſs to the lords juſtices, and council in *Ireland*, they having never made any return upon it to the king, it ſignified nothing to debar another's right.) And therefore I would not have what I intend to do reflect upon thoſe perſons of honour, that (though unknown to me) made uſe of my name to obtain the grant from the king, ſince in ſuch diſputable caſes, perſons, that act very differently from one another, may yet all ſatisfy their own judgments and conſciences in their proceedings. But in regard my intention in general was to apply an addition of revenue, if my friends procured any for me, to good uſes, though, I confeſs, I deſigned it rather for the advancement of real learning, than to any other purpoſe; yet ſince it ſo falls out, that unknown to me it is caſt upon impropriations, it is very likely, that by the account I expect of the ſtate of them, I may ſee cauſe to make the more immediate ſervice of religion, (by relieving the poor in thoſe places, and contributing, if need be, towards the maintenance of miniſters there, or elſewhere, or promoting other good works, as from time to time occaſion may require) the principal of theſe good uſes, to which I have thoughts to apply about two thirds of what will, de claro, come to me out of my ſhare of this grant, (hoping alſo, that the other perſons of honour, that are concerned in it, will have a care, that the impropriations, whoſe revenues are given them, be provided with miniſters.) And I ſhould poſſibly employ the other third part alſo the ſame way, but that his majeſty has been pleaſed, without my ſeeking, (or ſo much as knowledge) to appoint me governor to a corporation for the propagating of the goſpel among the heathen natives in *New England*, and other parts of *America*. And this corporation being at great charges for ſeveral neceſſary works, and eſpecially for the tranſlating and printing of the bible in the Indian tongue, above one half of their revenue is injuriouſly detained from them by a perſon, who had ſold it to a corporation erected for the ſame purpoſes with our's, under the late uſurping powers, and now has repoſſeſſed himſelf of his land, becauſe thoſe, that he ſold it to, were not legally qualified to have a ſale made to them. By which means ſo pious a deſign, as is purſued by this corporation, is now in danger to miſcarry for want of maintenance; ſo that the work being ſo charitable, and I having a peculiar call to promote it, I think, after having adviſed with the biſhop of *Lincoln* in the caſe, that it becomes me, on ſuch a juncture of circumſtances, to apply the other third part, or thereabouts, of what the king's grant will yield me for ſix or ſeven years at leaſt, to the carrying on of ſo unqueſtionably good a work; ſo that the main benefit I intend to derive from the king's bounty, is the opportunity of doing ſome good with what, if my friends had not obtained it, might have been begged by others, who would have otherwiſe employed it. And by this, I hope, your lordſhip will be confirmed in the belief of what I formerly aſſured you of, namely, that had I known, that any thing was aſked for me, whoſe grant would have been prejudicial or unwelcome to the church, I ſhould not have conſented to have my name made uſe of for a much greater matter, than the proviſo is like to yield me. And the ſame day your lordſhip did me the honour to inform me of the ſtate of the caſe, I offered ſome of the parties concerned to relinquiſh the grant, though it had already paſſed the king and council, ſo I nor my name might have nothing to do with it; but one of the intereſted parties being then too far off to be conſulted, the proffer was declined. From all which I hope your lordſhip will do me the right to conclude, that I was far from deſigning the prejudice of the church; and that though it cannot in reaſon be expected, that I ſhould do any thing to hinder the other perſons concerned in my proviſo to purſue the having it paſſed, and to enjoy the benefit of it; yet I do not at all deſire, that either your lordſhip, or any other perſon, that thinks the

proviſo

proviſo may be juſtly excepted againſt upon the church's behalf, ſhould, for my ſake, at all abſtain from acting and ſpeaking as his judgment and conſcience ſhall direct him: for as my partners are, and, I think, not cauſleſly, confident of being able to carry on in *Ireland* that, which has already paſſed the ſcrutiny here; ſo, for my part, all I pretend to, by this grant, is, to have the power in my own hands, to ſee, that the proceed of it be carefully employed to the good uſes, whereto I deſign it. And if in the management of this buſineſs my ignorance of the affairs of *Ireland*, to which you know how much I have been of late years a ſtranger, has in any thing miſguided me, I hope your lordſhip's goodneſs, and the fairneſs of my intentions, will incline you to make, and perſuade others to do the like, the beſt conſtruction of the actions of a perſon, that is ſo much,

My lord,

May 27, 2662. your lordſhip's moſt humble, and moſt affectionate ſervant.

SIR,

IN the ſtrange ſtory you did me the favour laſt week to entertain me with, there were ſome paſſages ſo ſingular and remarkable, that I cannot but renew the requeſt I then made you, that you would gratify me with an entire narrative of ſo memorable a tranſaction. And becauſe you were pleaſed very forwardly, and therefore very obligingly, to grant my requeſt, I may well forbear to ſolicit the performance of your promiſe; and ſhall only add ſomething about the manner, wherein I think it neceſſary to beg it may be performed; which, in the general, is, that, at leaſt, the main circumſtances of the relation may be impartially delivered, and ſufficiently verified, either upon your own knowledge, or by the judicial records, or other competent vouchers; for we live in an age, and a place, wherein all ſtories of witchcrafts, or other magical feats, are by many, even of the wiſe, ſuſpected; and by too many, that would paſs for wits, derided and exploded. And I have ſeen cauſe to think, ſo great a part of the vulgar ſtories, that have been confidently related, and greedily enough catched up, to have ill deſerved the entertainment they met with among well-meaning, but over-eaſy perſons, that I ſcarce believe one of twenty to be true, looking upon the other nineteen, as either falſe, or ſuſpicious; nor, perhaps, ſhould I have excepted the twentieth, if I had not had particular and conſiderable advantages to perſuade me, upon good grounds, that, though moſt of theſe ſtories be untrue, yet they are not all ſo, when I conſider, and am juſtly ſenſible, that to grant or deny, that there are intelligent beings, that are not ordinarily viſible, does much conduce to the reclaiming or confirming of atheiſts; I cannot but think, that thoſe men, in ſpite of their good meaning, have much diſſerved religion, and have obtruded upon the world ſo many improbable and ill-verified ſtories of witches and ſorceries, and that they took very wrong meaſures, in preſuming, that the multitude of ſuch relations would compenſate their want of credibility; whereas, on the contrary, ſome, among ſo many, being eaſily diſcovered to be falſe, or dubious, did not only make atheiſts exclaim, but even judicious Chriſtians ſuſpect, that the reſt were of the ſame kind. I hope, therefore, Sir, that your intended narration will reſume the credit of this kind of ſtories in the opinions of unbiaſſed men, by having its circumſtances warranted with teſtimonies, and authorities, which, the nature of the thing conſidered, may ſuffice to ſatisfy thoſe, that are diffident, out of cautiouſneſs, not prejudice. That this will be a good ſervice to religion, may be eaſily gueſſed by the great care, that atheiſts take to diſcredit all ſtories of this kind, as the products of impoſture, ignorance, or credulity: for if it could be proved, that moſt of them, as I fear it of too many of them, are of this ſtamp, yet any one relation of a ſupernatural phænomenon being fully proved, and duly verified, ſuffices to evince the thing contended for; and, conſequently, to invalidate ſome of the atheiſts plauſibleſt arguments: and, indeed, the foundation of them, as ſuppoſing the truth of what is aſſerted by many, as eye-witneſſes, and has been particularly affirmed to me by the illuſtrious count of *Walleſtein*, his imperial majeſty's miniſter here, that the famous frier *Wencel* has ſeveral times actually made tranſmutations of baſer metals into gold, in the preſence of the emperor, and divers noblemen, and good chemiſts; ſuppoſing the truth of this, I ſay, this one poſitive inſtance will better prove the reality of what they call the philoſopher's ſtone, than all the cheats and fictions, wherewith pretending chemiſts have deluded the unſkilful and the credulous, will prove, that there can be no ſuch thing as the elixir, nor no ſuch operation as they call projection; and upon ſuch a ſcore, I doubt not, but one circumſtantial narrative, fully verified, ſuch as I hope and deſire that yours may prove, will be preferred by the curious and judicious, to a hundred improbable, and ſlightly atteſted ones; ſince one cogent inſtance will evince, what a multitude of queſtionable ones have ſerved but to render the more ſuſpicious; I might add, that ſome of the particulars you mentioned to me, as (eſpecially) thoſe of the inſenſible marks of witches, and the way of detecting them, may ſuggeſt odd ſpeculations to a naturaliſt, and help to enlarge the ſomewhat too narrow conceptions men are wont to have of the amplitude and variety of the works of gold; ſince, if it appear, that there are intelligent agents, that are able to encreaſe

encreaſe; whereas men can but determine the motions of the parts of matter, the diſcovery of it may advantageouſly enlarge our knowledge, though not, perhaps, in phyſics, ſtrictly ſo called, yet in philoſophy; and therefore, by granting me this circumſtantial and well verified account, I requeſt, of the ſupernatural phænomena you have taken notice of, you may be ſure to oblige a great many curious perſons, beſides him, that you will in a particular manner engage to be, and to expreſs himſelf, upon all occaſions,

SIR,

September 18, 1677. your moſt affectionate and moſt humble ſervant.

[To Mr. *Joſeph Glanville.*]

To Mr. *Glanville.*

London, February 10, 1677-8.

SIR,

NOT daring yet to remove into the new built part of this houſe, the little room I am now confined to, reduces me to keep my books and papers too much huddled together. This notice, I hope, will obtain your pardon, for my not having earlier acknowledged the favour of your obliging letter, ſince I thought fit it ſhould be accompanied by one ſuch paper, as you write for, and which it coſt ſome time to find. I have heard many ſtories of things, that have happened within leſs than the memory of man, in *Ireland*, that would accommodate your deſign; but there was but one of them, which, by reaſon of ſome odd circumſtances belonging to it, and of the acquaintance I had with one or two of the chief witneſſes mentioned in it, gave me the curioſity to enquire more fully into the truth of it: to ſatisfy myſelf about which, I made uſe of the credit of ſome of my friends, that were then of great authority in that kingdom; and if I much miſremember not, a tranſaction, that paſſed years ago: it was my brother *Orrery*, who was then preſident of the province of *Munſter*, (which was the ſcene of our ſtory) that procured me, from the judge himſelf, the authentick account, that I now communicate to you. This you gave me a ſtrong invitation to put into your hands, by aſſuring me, that in the collection, where you intend it ſhall have a place, you are very careful to deliver none but well atteſted narratives; the want of which cautiouſneſs has juſtly diſcredited many relations of witches and ſorceries, and made moſt of the reſt ſuſpected; ſince in ſuch ſtories, the number of the whole can no way compenſate the want of truth, or of proof in ſome of the particulars; and a few narratives, cogently verified, will procure greater credit to the cauſe they are brought to countenance, than a far greater number of ſtories, whereof ſome, though never ſo few, are falſe; and others, though perhaps not many, ſuſpicious. But, Sir, you know too well the diſpoſition of thoſe you would convince, to need to be advertiſed, not to give any advantage to men, that are like to be very apt to ſeek, and much more to take it; which may be eaſily diſcerned by that very report, which, in anſwer to the latter part of your letter, I muſt take notice of, by telling you, that I know not who ſhould give out, that I have of late diſowned the ſtory of the demon of *Maſcon*, as a clear impoſture. For, whatever I may have thought of ſome incidental paſſages in the printed book, yet, as to the main ſtory itſelf, the converſation I had with the author, when the thing was pretty freſh in men's memories, and the notoriety of divers of the circumſtances, ſurmounted my indiſpoſition to believe ſuch things; and of late years, I remember not, that I have had occaſion to diſcourſe much of it, much leſs to diſown it; eſpecially after a learned and intelligent traveller, that ſome years ago paſſed by that town, and afterwards viſited me, informed me, that he found upon the place itſelf, juſt motives to believe the truth of it. The direction you ſend me, to addreſs my letters to you, at your houſe, in the college at *Worceſter*, makes me ſuſpect, that you have ſome preferment there, whoſe title I am a ſtranger to; and therefore I hope you will eaſily grant me your pardon, if, in the ſuperſcription, it be omitted, by,

SIR,

your moſt humble ſervant.

To Monſieur la *Marche* at *Caen.*

London, June 15, 1682.

MONSIEUR,

THIS week I received yours of the 30th of April; and having now a direction how to addreſs a letter to you, I muſt no longer delay giving you notice, that, though I ſuppoſe you may have had ſome deſign, as well to gratify me, as to advantage yourſelf, by ſending me the paper encloſed in your letter, yet, upon peruſal of it, I cannot think the proceſs probable enough to deſerve to be wrought; for it ſeems to me, (who am not altogether unacquainted with things of that nature) that the means are no way ſufficient to produce ſuch effects, as are aimed at by them; and therefore I am apt to think, that whoever gave you that proceſs, either had a mind to delude you, or was himſelf very ignorant in metalline affairs, or at leaſt intended to conceal his meaning, whilſt he uſed expreſſions, that ſeemed intelligible and clear enough. As for your deſign of getting an employment here, to inſtruct young gentlemen, the late perſecution of the poor Hugonots in *France* has brought ſo many of them into this country, who deſire the like employment, that it will not be very eaſy for you to find ſuch a condition as you wiſh. But, though I have ſome reaſon not to take it very kindly, that when I wrote to you three

or four years ago, about Mr. *Pierre des Cloſets*, and ſeemed much concerned to receive an anſwer, (and therefore, if I miſtake not, wrote more than once) you never vouchſafed me a line of anſwer: yet, if now you ſhall think fit to give monſieur who will be as ſoon as this letter in your parts, the beſt aſſiſtance you can, to recover all the papers of mine, that are to be found among thoſe of your great friend, monſieur *Pierre*, or wherever you know any of them are, (and which ought in juſtice to be reſtored to me) you will find, that you have not gratified an unthankful perſon, and, that this will be the readieſt way you could take, to engage me to ſerve you, on thoſe occaſions, that may be offered to,

SIR,

your humble ſervant,

ROB. BOYLE.

To Mr. *Chriſtopher Kirkby*.

SIR,

THOUGH I have not the vanity to think, that my opinion ought to be much conſidered, in the queſtion you have propoſed to me; yet, ſince you are pleaſed to require my thoughts about it, I ſhall, without heſitation, aſſure you, that I have long been, and ſtill am, of opinion, that the act of *Henry* the 4th has been, and, whilſt it ſhall remain in force, will be, a great diſcouragement to the induſtry of ſkilful men, which is very happily improved in this inquiſitive age. And therefore, that the repealing of a law, ſo darkly and ambiguouſly penned, will much conduce to the publick good, and be in particular advantageous to the counties of *Cornwall* and *Devonſhire*, where tin ſo much abounds, that it is (as you well know) a drug; is as well hoped, as it is heartily wiſhed, by,

SIR,

your moſt humble and

London, April 29, 1689. affectionate ſervant,

ROB. BOYLE.

To Monſieur *le Clerc*.

London, May 30, 1689.

SIR,

AFTER the many judicious extracts you have made of Engliſh books, I think I may preſume, that ſo great a linguiſt, as Monſieur *le Clerc*, is not unacquainted with the language of this country. And therefore I ſhall not ſcruple to employ it now, that I have an inviting opportunity to return you my humble and deſerved thanks for the rich preſents you have been pleaſed to ſend me, both by doctor *Abercromby*, and ſince by other hands. Theſe learned volumes are looked upon here, as deſerving the title they bear, of Univerſal Library; which I wiſh I could as eaſily contribute to, as I can readily applaud it. But, beſides the general acknowledgments I owe you, for other learned and curious pieces, I think myſelf obliged to pay you particular thanks for that, which you did me the favour to ſend me, about the poetry of the Hebrews. For though the weakneſs of my eyes has diſabled me, for ſome years, from proſecuting the ſtudy of that ſacred language, whereof I formerly was a cultivator; yet I have not ſo much forgot, what I once knew of it, but that I can diſcern your hypotheſis to be, at leaſt, a very happy and ingenious conjecture; and ſuch it has been eſteemed here by much more competent judges, than I pretend to be. The late publick revolutions, in theſe parts, have ſo buſied, and indeed engroſſed men's thoughts, diſcourſes, and pens, that very little has of late appeared from the preſs, beſides pamphlets, and other tracts, about political affairs, and oaths relating to them. And therefore I hope you will have the goodneſs to impute it to that cauſe, that this letter comes to you unattended by any philoſophical productions of this place. And, for my own particular, the want of health has, for this great while, ſo confined me to my lodgings, and ſo long expoſed me to a multitude of viſits, that rob me of all leiſure, that I have not been able to ſend any thing of that kind to the Royal Society, except a paper about a new way of ſuddenly producing flame by the bare contact of three bodies, each of them actually cold. The experiments contained in this writing are not yet made publick, nor brought back to my hands; but, as ſoon as they ſhall come abroad, either in the Philoſophical Tranſactions, or otherwiſe, I ſhall, God permitting, lay hold on the firſt conveniency of tranſmitting them to you, as a teſtimony, though but a mean one, of the reſpect and gratitude of,

SIR,

your moſt humble ſervant,

ROB. BOYLE.

London, Oct. 8, 1691.

Worthy DOCTOR,

IF you knew how very ill my ſiſter and I have been, ſince you left this place, you would not wonder, that you have not had from me an enquiry, how you bore your journey to *Saliſbury*; and whether you now enjoy the benefit of it, by the recovery of your health, wherein very many, and I moſt particularly, are concerned. Excuſe then, I beſeech you, my paſt ſilence, and give me, if you can, the contentment of an aſſurance, under your own hand, that you are well, which will be a great cordial to me. If I had known of your going ſo ſoon, I ſhould have furniſh-

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ed you with ſpirit of hartſhorn, and ſome other trifles, that you are pleaſed to let me provide you here. And therefore, if you want any thing now of that kind, be pleaſed to command it of me. Your conſtant kindneſs to me, and the benefits I have received from your ſkill and experience in your profeſſion, urge me to acquaint you with the diſtemper in my eyes, that did much ſurpriſe me, and does ſtill much afflict me, having continued with me for about a month. The caſe in ſhort is this; in the day time, I ſee, thanks be to God, as I uſe to do, and ſo till five o'clock in the afternoon; but then, as ſoon as candles are brought in, I find a very ſenſible decay in my ſight; ſo that, though I can ſee all the ſame groſs objects, as I did before, and could, if I durſt, read printed books, as I have often tried, yet the reflection from thoſe objects is not vivid, as it was wont to be; and if I look upon ſomewhat diſtant objects, methinks I ſee them through a thin miſt, or a little ſmoke, but when the candles are newly ſnuffed, and ſo the light increaſed, I ſee far better, for a little while, till it begin to have more ſnuff: this diſtemper continues, as long as I make uſe of candle-light, but the next morning, by God's goodneſs, I find myſelf as before, only now and then there ſeems to fall ſlowly down, ſometimes in one eye, and ſometimes in another, a faintly ſhining vapour, which immediately diſappears. I have ſuch apparitions of late, for theſe two or three years, without any bad conſequence. What this diſtemper may proceed from, I know not, though I remember I have heard you more than once take notice of the narrowneſs of my pupil. Sight is a thing ſo dear to all men, and eſpecially to ſtudious perſons, that I earneſtly beg, you would be pleaſed to conſider my caſe deliberately, and acquaint me with your thoughts of the cauſe; and more particularly, to ſend preſcriptions of the receipts you would have me employ, and your directions what elſe you would have me do towards the cure of it. I have had too much trial of your friendſhip, to doubt, that, upon ſo important an occaſion, you will refuſe me the effects of it, which will exceedingly add to your former favours, and oblige me to ſtudy the ways of ſhewing myſelf,

SIR,

your moſt affectionate

and moſt humble ſervant.

I HAVE, of your's, the water for clearing the ſight, which I much eſteem, and have more than once uſed; but I ſometimes uſe, upon your authority, a little honey diluted with ſuccory; but I much want the conſtant eye-water, to be uſed every night, or oftner, eſpecially if it may be fitted for the preſent ſtate of my eyes; and therefore beg, that you would be pleaſed to preſcribe me one, that I may make here. I forgot to tell you, that, for ſome months laſt paſt, I have been much troubled with what they call vapours, or fumes of the ſpleen, and with ſome ſcorbutick diſaffections.

[This was one of his laſt letters, and was ſent probably to Dr. *Turberville*, a famous oculiſt of *Saliſbury*, of whom mention is made by him, in a letter to Mr. *Oldenburg*, Aug. 29, 1664.]

Minutes of a letter to *Schottus*.

THAT his welcome letter, of ſuch a date, was, I know not by what accident, long detained by the way, as I preſume our learned friend, Dr. *Schroter*, may have informed him.

THAT this is the reaſon, why I did not ſooner let him know, that I thought it a great happineſs, that my poor endeavours have met with ſo much acceptance among the virtuoſi abroad, and particularly, that they ſhould procure me the honour of ſo obliging a letter, from a ſtranger, ſo famous and learned, as he, to whom I am glad of this opportunity to return my humble thanks for thoſe learned writings, wherewith he has obliged the curious; and particularly for his *Magia Mechanica*.

THAT I long to ſee his works encreaſed by the acceſſion of his *Technica curioſa*; towards which, I fear, I ſhall not contribute much, both becauſe of my being no better ſtocked with rarities, than I am, and becauſe I know not what particular ſubjects he treats of in it. But ſince he is pleaſed to expreſs a deſire of making uſe of my newmatical epiſtle therein, I ſhall freely leave it to his diſcretion, to preſerve as much of my book, as he thinks fit, in a work, that will be ſo laſting, as that he deſigns. And ſince he is pleaſed to expreſs a curioſity, which I fear they diſcern not, of honouring the reſt of my books with his peruſal, I ſhall take care to put as many of them as are tranſlated into Latin into the hands of Dr. *Schroter*, to whom *Schottus*'s recommendation, as well as his own merit, will make me a ſervant. In the mean time, I have obeyed his commands to our aſſembly (now called, the Royal Society) to which, I can aſſure him, that his great civilities have been very welcome, and that they are very thankfully reſented by it.

To Mr. *Oldenburg*.

SIR,

AS you begin your letter by a complaint of the retarding of the preſs, for want of the paper of colours, ſo I muſt begin mine by acknowledging, that you have reaſon to complain of it, and by adding, that yet it was not my fault; for I have been careful to lay aſide eight or ten ſheets, that I had peruſed, to re-deliver them to you, when I came to take leave of you, at my going out of town. But having laid them by, on the table, on purpoſe to have them in readineſs, and diſtinguiſh them from other papers, that were to be ſent to *Oxford*, they were, by the miſtake

of one of my ſervants, put up in a box, among ſome other writings, which I could not come at till now, that I am returned hither, where, that box being opened before my other things, I took out the roll of papers, which is already ſent away to Mr. *Herringman*, who is to receive the remaining ſheets, by the latter end of this week, if I can poſſibly diſpatch them ſo ſoon; at leaſt, he ſhall not fail, God willing, to have them ſent to him before the middle of the next week; which will be ſooner than the preſs will be ready for them. Your letter I found very ſeaſonably here, to refreſh me, after a wearisom journey, where I had far leſs opportunity, than I hoped for, to improve my little ſtock of knowledge, the ſeaſon being ſo far advanced, that I durſt not go viſit the mines at *Mendip*; and ſome ill accident or other having denied me the viſit I promiſed myſelf from our ingenious friend, Mr. *Beale*, to whom I ſent on purpoſe a meſſenger, that brought me back a letter, which bid me expect his coming, in caſe a diſtemper, that then detained him, ſhould not increaſe; ſo that my diſappointment being an argument of his indiſpoſition, was more unwelcome to me upon the account of its cauſe, than of itſelf. If you have heard any good news of him, you will oblige me, to acquaint me with it. I find them in *Dorſetſhire* far more ſolicitous to ſtore themſelves with fruit, than when I was laſt in thoſe parts; and my gardener has made a nurſery upon ſome land, that he rents, which furniſhes moſt of the neighbouring gentry, and lets me ſee, how much induſtry may advance at once the private and the publick good. I was viſited by the ingenious Dr. *Highmore*, from whom I had ſome odd anatomical obſervations, wherewith I may hereafter acquaint you. I ſhall rather tell you now, that he is a great floriſt, and finds by experience, which, I remember, has been likewiſe taught me by another eminently ſkilled in huſbandry, that there is ſcarce any mould comparable, for flowers, to the earth, which is digged from under old ſtacks of wood, or other places, where rotten wood has long lain. I have beſpoken ſome potato apples, againſt the ſeaſon. There has been found, not many miles from my houſe, a ſpring of purging water, and another, that works like *Tunbridge* water; but not hearing of them, till I was leaving the country, all I could do, was to deſire one to ſend after me a bottle of that, which was the moſt eaſy to come by. If I receive it, I ſhall endeavour to examine it. I was viſited at *Saliſbury* by the deſervedly famous oculiſt, Dr. *Turberville*, who has attained ſo much ſkill in the cure of diſtempers of the eyes, and performed ſuch remarkable things in thoſe caſes, that, being unable, as yet, to perſuade him to live conſtantly in *London*, I have perſuaded him to go thither, once or twice, at leaſt, every year; and that at ſet times, that men may know when to find him; and to ſtay there ſome weeks at a time, that he may be able to perfect ſome cures, before his return. The water of that town being very famous, for making better ale than can be made with other waters, I had the curioſity to weigh it with a good pair of gold ſcales; but have not yet had time to compare it with other waters, than which it ſeemed ſomewhat more clear and light. Since my return hither, viſits, and the unpacking of my books and implements, have left me ſo little time for other things, that I begin to wonder, how I have got ſo much as to trouble you with ſo long a ſcribble, which, ſince I began this laſt clauſe, I am ſummoned to releaſe you from, by forthwith ſubſcribing myſelf,

SIR,

your very affectionate friend, and very humble ſervant,

ROB. BOYLE.

Oxford, Aug. 29, 1664.

POSTSCRIPT.

I RETURN you my humble thanks for your ingenious communications, divers of which I locked not up from the virtuoſi here, and of which I cannot but deſire the continuation. What the poſtſcript of your letter mentions, in reference to ſuch matters, will not, if I can help it, be forgotten, upon an opportunity to ſerve the perſon concerned. I find not, in the tranſlated papers, that yet remain, that you have gone beyond the end of the 49th Experiment; for at the 50th there is three quarters of a ſide vacant, under the title Exp. 50; and that is the laſt page I have of your's. I have written to Mr. *Herringman*, to the purpoſe that was deſired at our parting, and I preſume he will readily comply.

IF you have heard any thing farther concerning the tranſlation of the bible into the Turkiſh tongue, I ſhall be glad to be informed of it; for, in caſe you hear nothing, that may divertiſe, Mr. *Seymore* and I reſolved, by God's permiſſion, to proceed, as ſoon as we ſhall be informed, either what farther anſwer you have received about it, or, that you have received none.

I FORGOT to tell you, that I did not forget to ſpeak to Dr. *Wallis*, who has received the commands of the Society, and will be very ready to comply with them, about the papers of Mr. *Horrox*; with which I find he is ſo much pleaſed, that he does not a little regret the untimely death of ſo hopeful an aſtronomer.

MY moſt humble ſervice to my lord *Brouncker*, Sir *Ro. Moray*, Dr. *Wilkins*, and the reſt of my Greſham friends.

To Mr. *Oldenburg*.

SIR,

THE news you were pleaſed to ſend me from *Guinea*, I do, with you, look on as very conſiderable; and I am much of your mind too, in what you conjecture about the conſequences of it. I ſhould have told you, in my laſt, that I am very glad monſieur de la *Quintenaye*'s

Quintênaye's ways of improving fruit trees have ſucceeded ſo well, and more, that he gives us hopes of communicating them to the world, or, at leaſt, to the Society. And as to what he deſires concerning an Iriſh greyhound, though the breed of them be now almoſt worn out, yet, when my ſiſter *Ranelagh* (who has, eſpecially at this time, far more correſpondence in *Ireland* than I have) ſhall be returned to *London*, you may command me to try what, by her means, may be done. I have received the papers you ſent me, concerning weather glaſſes, and have a little altered the titles, to make them more ſuitable to the Hiſtory of Cold, whereunto I deſign to prefix them, as preliminaries. One of the three diſcourſes, into which they are divided, I have already read over, and ſo can diſpatch to you, by the firſt conveniency, that the printer may forthwith fall to work; the other two I was hindered from reviewing this day, but intend to diſpatch it ſo ſoon after the former, that the preſs ſhall not ſtay for it. And though I have not, even at *Oxford*, half ſo much time at command, as you may think, and I could wiſh; yet I chuſe rather to defraud my other ſtudies, than not allow daily ſome time to the finiſhing of what I have by me of the hiſtory of cold, wherein I have made a progreſs, which, though inferior to what I intended, will yet, I hope, enable me to ſend away all that is at this time to be publiſhed, before the 10th (perhaps before the 1ſt) of November. To the learned and induſtrious Dr. *Merret* you will oblige me to preſent my humble ſervice, and to let him know, that if I had found his Chriſtian name at length in his own book, I ſhould have given it him in my letter; but though I gave him not his right name, yet, I preſume, it will not be thought I wronged him in the name I gave him. But (raillery apart) I think it were not amiſs, that his ingenious obſervations be printed in the ſame letter and volume with my hiſtory, but in an alphabet by itſelf; for by this means, theſe two differing pieces need not ſtay for one another, but the preſs may go on with them both (which will ſave time) and, in the interim, it will be eaſy to reſolve, which of the two ſhall be premiſed. The obſervations of huſbandry you were pleaſed to ſend me, I intend to add to thoſe others, that I received from the ſame hand before. And, leſt this letter ſhould be altogether barren, I will, on this occaſion, add, that, having, in ſeveral places, been inquiſitive about the phænomena of the ſenſitive plant, I learned of a very induſtrious perſon (though no ſcholar) that it may be, and has actually (and that of late too) been propagated, even in our climate, otherwiſe than by ſeed. The way is eaſy, though ſomewhat odd; and, which moſt recommends it, agreeable to his own experience. But it is ſo late at night, that I have not time to ſet it down particularly.

I OWE you many thanks for the trouble you were pleaſed to put yourſelf to, of writing ſo concernedly to *Amſterdam* about the Turkiſh bible. And though, upon the advertiſement you gave me from thence ſome weeks ago, we had thoughts of deſiſting from our endeavours here, leſt *B. Warnerus*'s labours ſhould prevent ours, or blaſt them; nevertheleſs, ſince his own friends at *Amſterdam* do not know, that that worthy man, as yet, has done any thing upon the new teſtament, and ſince they themſelves not only allow of, but wiſh for, our proceeding, we are not willing to be diſcouraged from ſo charitable a work, as that we were upon. But as we have a great reſpect for *B. Warnerus*, and his moſt laudable attempt; ſo we are willing to deal openly and candidly with his friends at *Amſterdam*; and to this end, as they will much oblige us, to ſend us over a printed ſheet of his edition, if they have any one in their hands, ſo we intend, by the next poſt, to give you the trouble of ſending to them a printed ſheet of ours, that if they, or any friend of theirs, be ſufficiently ſkilled in the Turkiſh tongue, to make a judgment of it, we may have their ſenſe upon it, and their advice touching any thing, which they think may be either corrected or amended; and ſuch reflections of theirs we ſhall receive as favours, and the rather, becauſe I find, by ſome letters, of a freſher date than yours, that when our Turkey merchants heard, that I had thoughts of deſiſting from what I was upon, ſome of them ſhewed themſelves more heartily concerned, that ſuch a work ſhould not be laid down, but be vigorouſly carried on, than I and my friends here expected. I ſent away your letter to Dr. *Wallis*, who indeed deſerves the thanks of the Society, for the great pains he took about Mr. *Horrox*'s papers. What apparatus we ſhall have, to obſerve the conjunction, I cannot yet tell; for though he and I were twice at the ſchools, to take a view of the implements of the obſervatory, yet we could not get in, the key having been, by ſome miſtake, or negligence, either loſt or carried away. But if it cannot be found, to-morrow, I mean to urge the having the door broken open; that the commands of the Society may be, as far as we are able, obeyed by him, and by,

SIR,

your very affectionate and

very humble ſervant,

ROB. BOYLE.

[This letter was wrote about the beginning of October, 1664.]

To Mr. *Oldenburg*.

Oxford, Sept. 8, 1665.

SIR,

AS I was laſt Saturday in the evening diſpoſing myſelf to write to you, I was hindred by the unexpected arrival of my lord and lady *Clifford*, and ſince that have been tied to ſo much attendance on my lord Chancellor, my lady *Clarendon*, and her new daughter-in-law, my lord Chamberlain, and others, that went away but this day, that I have been fain, though very unwillingly, to omit acknow-

ledging the favour of your letter, wherein I found, that I had cauſe to return you my thanks for your reſentment of an information, wherein you ſuppoſed me concerned, though indeed I were not at all ſo. For neither do I believe, that any ſuch thing, as our worthy friend Dr. *Beale* was told, was at all deſigned; neither if it had been propoſed, would it have been much welcomed. I did, as I promiſed you, take out my burning glaſs, which, though but of ten inches in diameter, is made of ſo good a metal and figure, that it will not only in a moment almoſt kindle an ordinary ſtick of wood, but in a trice melt laminated lead, and in a ſhort time colour bright iron or ſteel, and make it ſmoke, and will perform divers other things, of which, I remember, I have ſome where ſet down ſome memorials. I preſume I may in my next tell you the diameter of ſome of thoſe concaves, that they yet have in *Italy*, there being here ſome perſons lately come from *Rome*, that have let me know they mean to viſit me; and I confeſs, I think the making of ſuch burning glaſſes not unworthy to be encouraged, being apt to imagine, that if I had one of them, I could make it in more ſenſes than one condenſe the beams of light. If your friend be maſter of any of them, I would gladly have a few experiments (not difficult) recommended to his trial, having already collected divers obſervations of that ſort, but made with ſmaller glaſſes, in what I formerly writ about heat and flame. I was lately making ſome trials with the petrified wood I told you of, which I find to be a very odd ſubſtance wonderfully hard and fixed; and I have got alſo a parcel, that looks like iron ore, and is very heavy. If I had opportunity to reprint the Hiſtory of the Fluidity and Firmneſs, which I have often been ſolicited to do, I could add divers things about ſtones, that perhaps would not be diſliked; and I hope, if God vouchſafe me a little leiſure, to inſert ſeveral of them in fit places of that hiſtory againſt the next edition. Here is a certain ſtone, that is thought to be petrified bone, being ſhaped like a bone with the marrow taken out; but with a fit menſtruum I found, that I could eaſily diſſolve it like other ſoft ſtones, and poſſibly it may prove as fit as oſtiocolla for the ſame medicinal uſes. I am much obliged to thoſe virtuoſi in *France*, that are pleaſed to entertain ſo favourable an opinion of my poor endeavours to gratify ſuch as they; but I have not of late had any opportunity to proſecute my ſtudies vigorouſly, the perpetual reſort of Engliſh ſtrangers, and the want of glaſſes and other mechanical employments, leaving me neither leiſure nor accommodations ſuitable to my deſires and deſign: yet, if I had not forgot it, I ſhould a fortnight ago have told you, that among ſome hydroſtatical things I was once purſuing, I bethought myſelf of an eaſy ſlight inſtrument, which I called the meaſuring (or ſteriometrical) balance, whereby I can, without rule, or compaſſes, *&c.* or calculation, a meaſure with greater exactneſs, than by the geometrical ways, the magnitude of ſmaller bodies, whether regular or as irregular as you pleaſe. Of this I may hereafter tell you more, if God permit; in the mean time begging you to take notice of the date of this, I muſt, to conclude with my paper, ſubſcribe myſelf abruptly,

SIR, your's, *&c.*

R. B.

DOCTOR *Wallis* deſires, that if you have any conveniency, you would do him the favour the firſt opportunity to convey the encloſed according to the addreſs (he not knowing how otherwiſe to get it ſent) in which requeſt I join with him.

To Mr. *Oldenburg*.

March 19, 1665.

SIR,

THIS afternoon, before I had got an opportunity to acknowledge yours of the 13th, I received another of the 17th, and muſt now return you my humble thanks for both together. And to anſwer the former firſt, I wonder not there ſhould be a miſtake in the barometrical paper I ſent you, the haſte I was in having kept me from reading it over; which miſtake lying but in one word, is eaſily mended, by putting inſtead of the other, and of the varying weight, *&c.* the other cauſes of the varying weight, *&c.* But the tranſcript you are pleaſed to ſend me of this paſſage, lets me ſee, that in thoſe words, to a greater height in the air, the three laſt words, *viz.* (in the air) ſhould have been omitted. Since the obſervations came not time enough, it is poſſible I may be able to add a few more to them, before your next come abroad. I have been able to procure ſo little account, ſo much as of the country, where *Bombay* is ſeated in the *Eaſt-Indies*, that I can ſupply you with no queries about it. And as for *Dantzick*, there are only two enquiries, that now come into my mind concerning timber; the one is, whether the learned *Hevelius* or his friends have ever obſerved, what I have met with in a modern author of very good account, that lumps of amber have been taken up, within whoſe middlemoſt parts, when the hard outſide was broken, there has been found pretty ſtore of uncoagulated naphta or bitumen: and this I rather take to be a conſiderable query, becauſe of the other I am to ſubjoin, which is, whether it have been obſerved, that pieces of amber have been taken up ſticking almoſt like gum to great pieces of the barks of trees. For more than this is affirmed upon his own repeated obſervation, by one of the judicioſeſt travellers I have yet read. But now I ſpeak of queries for foreign countries, I muſt beg your pardon, that my haſte made me forget the laſt time to ſend you, as I intended, a paper of general queries. It belongs to one of the eſſays of the unpubliſhed part of the Uſefulneſs, *&c.* and therefore poſſibly may not ſo much anſwer your expectation, as if it had been written entirely for your purpoſe.

But

But perhaps too, it may ſerve your turn pretty well, eſpecially with a little addition, which if you make uſe of it, I can afford it. I have ſomewhere ſome ſpecimens of particular enquiries, ſubordinated to ſome of the more principal articles of inquiſition, which I ſhall ſcarce take the pains to look out, till I know, whether the paper I now ſend may be of uſe to you. If you have occaſion to take any publick notice of it, be pleaſed to intimate to what treatiſe it belongs. I am very much obliged to my lord *Brouncker*, for the favourable acceptance and character he has vouchſafed my hydroſtatical trifles; and I am glad his lordſhip's obſervations agree with mine about the great height of the quickſilver in droughts: but I forgot, and was ſorry I did ſo, to tell you in my haſtily written paper, that one cauſe of that height I ſuſpected may be, the elevation of ſteams from the cruſt or ſuperficial parts of the earth, which by little and little may add to the weight of the atmoſphere, being not, as in other ſeaſons, carried down from time to time by the falling rain, to which it agrees not ill, what I had ſince, namely this week, occaſion to obſerve. For whereas about this day ſennight at *Oxford*, the quickſilver was higher than for ought I know has been yet obſerved in *England*, viz. above $\frac{5}{16}$ above 30 inches, upon the firſt conſiderable ſhowers, that have interrupted our long drought, as I foretold divers hours before, that the quickſilver would be very low, a bluſtering wind concurring with the rain, ſo I found it here at *Stanton* to fall $\frac{3}{8}$ beneath 29. This you may, if you think fit, add to the other obſervations, or communicate with my humble ſervice to the worthy Dr. *Beale*, of ſome of whoſe ingenious conjectures perhaps I could already give you an account; but having not time to do it, I muſt defer it till God grant us a meeting, and then we may diſcourſe about the other buſineſs you write of, which I am very willing to defer it till that time. In the interim, if you tranſlate your Tranſactions into Latin, I ſhall gladly receive a ſeaſonable notice of it before-hand, that I may now and then be the better able to ſerve you in them. I expect to morrow ſome books of the Origin of Forms ready, and hope this week to ſend you one as you deſire; which is all, that can in this paper be told you, by,

SIR,

your very affectionate friend,

and very humble ſervant,

ROBERT BOYLE.

To Mr. *Oldenburg*.

October 17, 1667.

SIR,

I THINK you have pitched upon a good courſe about the catalogue of my writings; only if you mention it at all, you may be pleaſed to remember to add to the reference, that the two tracts of the Origin of Forms, and of Hydroſtatical Paradoxes, mentioned in the catalogue you ſpeak of, annexed at the end of the *Hiſtory of cold*, came forth ſince that hiſtory. I hinted to you in my laſt ſomething about the original of the experiments made in *Italy*, by injecting acid liquors into the blood; to explain which I ſhall now tell you, that about this time three years, I mentioned at *Greſham* college to the Society an odd experiment I had formerly made, (not by chance, but deſign) upon blood, yet warm as it came from the animal, *viz.* that by putting into it a little aqua fortis, or oil of vitriol, or ſpirit of ſalt (theſe being the moſt uſual acid menſtruums) the blood not only would preſently loſe its pure colour, and become of a dirty one, but in a trice be alſo coagulated; whereas if ſome fine urinous ſpirit abounding in volatile ſalt, ſuch as the ſpirit of ſal armoniac, were mingled with the warm blood, it would not only not curdle it, or imbaſe its colour, but make it look rather more florid than before, and both keep it fluid, and preſerve it from putrefaction for a long time. This experiment I deviſed among other things, to ſhew the amicableneſs of volatile ſpirits to the blood. And I remember it was ſo much taken notice of, that ſome very inquiſitive members of the Society came preſently to me, and deſired me to acquaint them more particularly with it, which I readily did, though afterwards I made ſome farther obſervations about the ſame experiment, that I had no occaſion to relate. This having been ſo publickly done, though I will not ſay, that ſeignoir *Fracaſſati* might not have hit as well as I upon the experiments publiſhed in his name; yet there is ſo little difference between the warm blood of an animal out of his veins and in them, that it is not very improbable, that he may have had ſome imperfect rumour of our experiment, without knowing whence it came, and ſo may without any diſingenuity have thence taken a hint to make and publiſh what you have Engliſhed for him. Perhaps you will find ſome entry made of my narrative in the journal of the Society; and if it be thought fit, that, without at all reflecting upon our Italian author, any mention be made of what I related ſo long ſince, I think I can ſend you ſome other circumſtances belonging to it. For I remember I tried it with other liquors, (as ſpirit of wine, oil of tartar, oil of turpentine) and I think I can ſend you ſome remarks upon the colour of the upper part of blood. And I ſhall on this occaſion add in reference to anatomical matters in general, that after I ſaw how favourably the Uſefulneſs of Experimental Philoſophy was received, I was invited to enlarge it in another edition, and for that I provided divers anatomical as well as other experiments, and deſigned many more; ſo that I have by me, if I have not loſt them, divers things, that would not perhaps be unwelcome to anatomiſts. But I am ſomewhat doubtful, how to diſpoſe of them, having found by experience, that if a man

man proceed not cautiouſly in ſuch matters, he may hereafter be thought to have ſtolen from others, what indeed they owe, either mediately, or immediately, to his communication. I could ſafely truſt the Society with them, as the looſe papers, that contain them, come to my hands; but, perhaps, it would not be ſo proper to put them out as my own, after they ſhall have been, not only tried, but, as no doubt they will be, improved there, unleſs the Society ſhould think fit (which yet I ſhould be loth to move) to leave their members a liberty of publiſhing the experiments, either preſented or propoſed to them, with all the additions they ſhall receive from their being made at the Society, with a ſignification (where it ſhall be thought neceſſary) that ſuch a part was the author's, or the propoſer's, and ſuch the improvements of the Society. But of this I would beg you not to diſcourſe, unleſs it be with our noble preſident, or without naming me. For, perhaps, it will not be amiſs to ſtay, till I ſhall be able, through God's permiſſion, to talk with you about it at *London*. In the mean time, I have ſent to Mr. *Herringman*, to deliver you the books you ſhall call to him for, in the name of,

SIR,

your very affectionate friend,

and very humble ſervant,

ROB. BOYLE.

THERE is a little piece come out of *Schwammerdam*, which is laid by for me, but I have not yet ſeen it. If I miſtake not, it treats of reſpiration; and therefore may be fit for your looking into. If I can find one of my old note books, that I had in my hands ſince I came laſt to *Oxford*, I expect to meet there with ſomething about that ſubject. If you try the injection of ſaline liquors into the veins, be pleaſed to try the injecting of ſpirit of ſal armoniac, or of hartſhorn alone; and alſo preſently after the injection of a corroſive liquor: for I remember I made a ſomewhat like experiment, which I have not now time to ſet down. You will oblige me to put, from time to time, in a diſtinct ſheet of paper, the dates of thoſe letters of mine, wherein I mention to you my own experiments made or propoſed.

To Mr. *Oldenburg*.

Oct. 26, 1667.

SIR,

I AM not ſorry you found the relation, which your curioſity (and perhaps your civility too) made you ſearch for in the journal of the Society. But I am ſtill of opinion, that ſignior *Fracaſſati* be tenderly dealt with. What other thing (of that nature) you ſay will ſurpriſe me, I almoſt long to know. The obſervation you mention in your Tranſactions, about the florid colour of blood, is pretty, and, in the trials I have made of it, it holds true: the reaſon alſo given by the author may, perhaps, be good. But I have tried ſome things, that may much help to determine, whether it be or no; of which, if it be deſired, I can eaſily give an intimation. I am glad Dr. *Lower* and Mr. *Collins* are elected into the Society; for I take them both to be able and induſtrious men, in their ſeveral profeſſions, and deſire to have my ſervice very particularly preſented to the former of them; as alſo to worthy Dr. *Beale*; as to whoſe obſervation about the ♀, I remember, that within a day of the time he mentions, I obſerved it to be here extraordinarily low, and ſo did Dr. *Wallis*, (in his baroſcope) whom I ſpoke with about it. I humbly thank you, for the care you have been pleaſed to take, about the diſpoſal of the books; and I ſent to Mr. *Herringman*, to deliver you thoſe, that you ſhall call to him for; among which, I muſt beg not to forget one for yourſelf, if you have it not already. You will find it ſomewhat difficult to give, in few words, an account of my Diſcourſe of Subordinate Forms, which coſt me more thinking than poſſibly thoſe, that have not attentively looked into that intricate ſubject, will imagine.

CARE will be taken for the future, that the letters I ſend you be dated. But, in caſe at any time it ſhould be forgotten, you may be pleaſed in great part to ſupply the omiſſion, by endorſing on the letter, when you received it; for by that it will appear, that, at leaſt, it was written as early, as the time mentioned in the endorſement. And I am the more ſolicitous about this matter, becauſe frequent experience ſhews us, how much our Engliſh have loſt, for want of being ſo; and (which is more conſiderable) how difficult it is, otherwiſe, to avoid the occaſions of perſonal diſputes, or reflections; which, for my part, I heartily deſire to ſhun.

IF I can conveniently (for I have been theſe two days not well) I may, in my next, impart to you an experiment, as odd as moſt I have met with, and which will, perhaps, ſet ſpeculative wits awork, as much as another. When it ſhall have received what improvements the Society will make of it, it is very like I ſhall leave you at your liberty to diſpoſe of it; but, in the mean time, I muſt deſire you not to take notice of it, and ſhall intimate, at preſent, that it is a quite new way of deſtroying and re-producing light. I have alſo lately put in practice another thing, about which I muſt earneſtly deſire your ſecrecy. For, though long ſince, perhaps, ſome years, I was ſo hopeful of a ſucceſs, that I ſet down, and have now by me, a long catalogue of experiments, that, I think, never have been made, (nor, perhaps, deſigned) that may be tried by the help of this invention; yet, for want of tools, and becauſe the nature of the experiment requires time, I have not been able as yet to perform them. But the thing I pretend to do, in ſhort, is this; to ſeal up glaſſes hermetrically, when without

without the help of heat (for it is done by the engine) they are more exhauſted of air, than an Æoli-pile has been yet brought to be, by the help of heat. And this I have actually done, and that by ſeveral ways. And if it pleaſe God to bleſs me with health, as he has in ſome meaſure in my mechanical attempts of late, I hope to make good what I lately writ you, that though the ſtudy of nature would not be courted at the old rate, yet neither will it be deſerted, by,

SIR,

your very affectionate friend,

and very humble ſervant,

ROB. BOYLE.

IF you hear any thing of the judgment made of my Eſſays and Experiments of Colours, now they are diſperſed beyond ſea, I ſhall be glad to know it. I hear nothing of your proſecuting at the ſociety the buſineſs of reſpiration; nor have I yet read *Swammerdam.*

To Mr. *Oldenburg.*

Dec. 29, 67.

SIR,

I HAVE no exceptions to the title page, which you deſign to prefix to the experiments of light, if you have good warrant for the laſt words of it, which, to me, ſeem complimental enough. I ſent you on Tueſday the concluſion of the poſtſcript, which, I hope, you have received, and to which I am not like ſuddenly to make any additions. For, without telling you now, whether I could or no, I muſt confeſs to you, that I am tired with inſiſting ſo long upon one ſubject; eſpecially ſince it hinders me from proſecuting ſome others, for which I have a ſtronger inclination. If, when thoſe experiments about light come forth in Latin, you think fit to ſay ſome little thing to the reader, either about the nature and deſign of the tranſactions, or about thoſe experiments; I ſhall neither perſuade nor oppoſe it. But I think it will be convenient to make the very firſt words of the Engliſh account itſelf, I ſent you, to be preceded by a long ſtroke in the ſame line, to intimate, that the letter did not begin there; leſt, without ſuch intimation, the beginning may appear, either too abrupt, or not ſo civil to you, as I deſire my writings ſhould be thought, as well as be. If you can conveniently do it, (and not otherwiſe) I ſhould be glad, that in the Latin edition ſome intimation were given the readers, that, whereas two ſeveral books of mine have been lately printed in *Holland*, viz. the *Phyſiological Eſſays*, and the *Book of Colours*, without any notice taken, as I am informed, either that they were ever printed in *England*, or ſo much as tranſlated out of Engliſh; whereas, I ſay, I am told this, if by the title pages of the books (whereof Mr. *Davis* tells me, ſome are come to *London*) you find it to be true, I ſhould be glad, that a ſhort intimation were given, that thoſe books were tranſlated out of Engliſh, in which language the eſſays were publiſhed in the former part of the year 1661, and the latter, before the middle of the year; which I therefore deſire to have a little notice given of, becauſe, that if they ſhould be ſuppoſed to be publiſhed but this preſent year, I may be ſuſpected to have taken divers things from others, which they, indeed, borrowed of me. The experiment of transfuſion, made upon a mad man, I ſhall look upon, if the cure hold, as a very conſiderable thing, and capable of improvements. I am glad the Florentine experiments are at length publiſhed; which I remember a learned ſtranger, that came from thoſe parts (and whom I never ſaw before nor ſince) told me, eight or nine months ago, they had been long before, if it had not been perceived, that ſome things of mine, that were already out, would, probably, keep divers of them from ſeeming new, or appearing ſo conſiderable, as was hoped. But, perhaps, this was but this gentleman's conjecture, or compliment; and, however, I cannot think, but ſuch ingenious perſons, as the excellent prince *Leopoldo*, and ſome of the other Florentine virtuoſi, muſt needs have made divers experiments, that would be very welcome, and inſtructive. What you ſay of the French book you have received, gives me a great curioſity to ſee it, and makes me deſire, that you would be pleaſed to order Mr. *Crook*, or ſome other bookſeller, to ſend for it to *Paris* for me; and if, in the mean time, when you have done with your's, you can ſpare it me for a while, it ſhall, God willing, be thankfully returned you. I ſent you on Tueſday a paper ſealed up, with a ſuperſcription, that deſires it may not be broken open, till you hear farther from me about it; which requeſt I muſt yet continue, and now give you this reaſon for it, that that packet is the ſecond part of ſome papers, whereof I cannot ſend you the firſt part, though I was made to hope, to have it tranſcribed time enough, and do expect to be able to ſend it you in a few days. The author of the book *De Viribus Percuſſionis*, I look upon as a ſubſtantial writer; but there are ſome here, (who are not wont to be vain glorious) that think, that on that ſubject he will teach them little, that they know not already. I am glad of your correſpondence with monſieur *Carcavi*; but though to gratify both you and him, I have conſulted our library-keeper (and not him only) about the catalogue of books, printed in *England* during the laſt twelve years, yet my endeavours have not proved ſucceſsful: for though there be a law, that gives this univerſity an exemplar of every book, that is printed; yet that law, for want of an annexed penalty, has been but very negligently obeyed. But thus much I have learned, which, I hope, may do you ſome ſervice, that you may find a catalogue of all the books printed at *London*, within

within the time mentioned, by getting a ſearch made in the regiſter of the Stationers-hall, of which for the two laſt years, I hope a copy may be here procured you, by,

SIR,

your very affectionate friend,

and very humble ſervant,

ROBERT BOYLE.

I AM ſorry the perſon you mention in your poſtſcript has been ſo much your enemy, as to oblige you to be his. I have obeyed you to Dr. *Wallis*, who is much your ſervant. If you had been here this week, I could have ſhewn you divers aerial experiments, which would (ſome of them at leaſt) have let you ſee, that the air, as tranſparent as it is, has not yet diſcloſed to us all, that may be diſcovered in it. I deſire to have my humble ſervice preſented to Dr. *Beale*, Mr. *Glanvill*, and Mr. *Colepreſſe*, and to the firſt of them my thanks for his kind remembrance.

To Mr. *Oldenburg*.

February 1, 166$\frac{7}{8}$.

SIR,

A VISIT made me ſince ſupper has left me ſo little time to anſwer your letter, that I am reduced to leave divers paſſages of it untouched, that I may be able to tell you, that I am very glad, that the Florentine experiments are at laſt come out, and are like to be ſhortly in ſuch good hands as yours. I ſhewed my lord *Brouncker*'s ſolution to Dr. *Wallis*, who, I ſuppoſe, will take notice of it to you; and I was this day at Dr. *Wren*'s lodging, but could not meet with him, nor conſequently diſcourſe with him about Mt. *Hooke*'s way of eſtimating the preſſure of the air. I am glad the experiment of transfuſion has at length ſucceeded ſo well at *Paris*. For I confeſs, I have good hopes it will at length prove a very conſiderable one. I thank you for the advertiſement you are pleaſed to give me according to my deſire about the collection. The fifty pound, I told you I was ready to contribute, will, I hope, be received for me at *London* within a week or ten days; and if there be, before you hear from me again, an occaſion to mention it at the council, you will oblige me to do it for me with all due expreſſions of affection and reſpect, together with ſome little apology grounded upon the great prejudice, not to ſay ruin thoſe, that belong to *Ireland*, undergo by the ſtop of their almoſt only trade, the tranſportation of cattle. When the other members of the council pay in their contributions, upon your leaſt intimation I ſhall, God willing, be ready to give order for the payment of mine, which, as I was ſaying, I doubt not would be received for me within theſe very few days. I am glad of what you tell me concerning young Mr. *Stroude*, to whom pray, if you ſee him, be pleaſed to preſent my humble ſervice, and deſire him to do it for me to his father Sir *William*; and if he have any minerals for me, as I ſuppoſe he may have, you will oblige me to perſuade him to leave them in your hands, or at my ſiſter *Ranelagh*'s. I muſt before long be a ſuitor to you for ſome letters of recommendation for the ingenious Mr. *Colepreſſe*, when he goes to travel, and where you think, that it may ſerve him to have it known, that I was one of thoſe, that requeſted you to recommend him to the acquaintance of ſome ingenious men, you are at liberty to take notice of it. We have no luck in our enquiries about the ſenſe of the modern Greek church. For the critick, I mentioned to you in my laſt, was five days ago ſuddenly hurried away to *London*; but yet when he came to take leave of me, I would not give it him, till for all his haſt he had in a ſnip of paper, that was at hand (and which I encloſe you) ſet me down the names of thoſe books, which he ſays prove the diſſent of the Greek church from the Latin in the point of the ſacrament; and he added, that one of the three authors (which I have therefore ſince marked with an aſteriſk) has a full confutation of *Baronius*'s ſtory of the reconciliation of the Greek and Latin churches. I had in my hand a liſt of a pretty number of pneumatical experiments, made in order to the continuation of the engine book, which catalogue I intended to have ſent you, but only for your own view, together with this letter; but the party, to whom I entruſted it, having not (I ſuppoſe by reaſon of the much company I have had this afternoon) thought fit to reſtore it, as I expected, it cannot be ſent you till the next opportunity I have of naming myſelf,

SIR,

Your very affectionate friend,

and very humble ſervant,

ROBERT BOYLE.

To Mr. *Oldenburg*.

Feb. 21, 1667-8.

SIR,

I AM obliged to you for ſo early diſpoſing of the ſealed paper I troubled you with. The objection, that was made you, about the ſociety's order, in reference to ſuch papers, was not altogether unreaſonable; but I think your anſwer to it was very juſt; the deſign of that order being only to ſecure thoſe, that deſire to enjoy the benefit of it, againſt the uſurpations, not the induſtry or out-doings of others; and if I had been there, I could have added, that as to what concerned my paper, in particular, the invention (if it deſerve that title) there mentioned is not only hinted, but clearly ſet down. Such a book of the Uſefulneſs, *&c.* as I could get ready bound (and your haſte made me unwilling to ſtay for the better binding of another) I have this

this morning ſent you, and ſhall beg you to accept of from me. It is my unhappineſs, more than that of your Italian virtuoſi, that I am not at *London* to converſe with them; but I am apt to think, you have rightly gueſſed at the reaſon of the preface they made you about the Florentine experiments. Dr. *Wallis* and I have been this night endeavouring to ſee the new ſtar, but were hindred by cloudy weather; which has laſted longer than I remember to have known theſe many years; ſo that I have been kept from proſecuting an experiment or two, I made about a month ſince, touching the burning of bodies in vacuo (as they call it) though what I then obſerved, together with what I tried, to almoſt the ſame purpoſe, about the line deſcribed by moving ſmoke, ſix or ſeven years ago, make me think ſuch trials worth the being purſued. If I can get it tranſcribed, I may ſend you, by this poſt, a liſt of about half a ſcore of experiments, that ſhould be added to the catalogue you laſt received; and will, I hope, be looked upon by you under the ſame notion with the former. I have enquired about the bones your poſtſcript mentions, but as yet I cannot hear ſuch matters. If, upon further inquiſition, I can, you may (God permitting) expect an account from,

SIR,

your very affectionate friend,

and very humble ſervant,

ROBERT BOYLE.

To Mr. *Oldenburg*.

April 3, 1668.

SIR,

I AM not ſorry, that the reputation of our Society encreaſes abroad, but we ſhall have cauſe to be ſorry, if nothing be done at home (by thoſe, whom it moſt concerns) to enable us to make it good. I am glad you are like to ſettle a correſpondence with *Rome*, that being the chief center of intelligence; nor is it unwelcome news to me, that you are like to receive, from time to time, an account of what will be done in the academy at *Caen*, though poſſibly, if our Society had ſuch encouragement, as you ſay monſieur *Colbert* gives that learned company, *England* would be able to give *Normandy* as good as it brings. The diſſection of a camel being that, which in theſe parts we have had no opportunity to make, may well, according to what you intimate, afford us ſomething of conſiderable. You are not at all miſtaken, in thinking, that I have had my ſhare of troubleſom viſits from ſtrangers, and that I would not invite my friends at *London*, to procure me any more of them; but I aſſure you, I except the converſation I lately had with monſieur *Paiſan*, who left me with extraordinary profeſſions of ſeveral kinds, and to whom, if he be yet at *London*, you will oblige me, to preſent my humble ſervice. I perceive I am very much beholden to monſieur *Sheutius*, for the very favourable mention he is pleaſed to make of me and my triſles. When I have the happineſs to ſee you again, I may ſuggeſt ſome queries, about the mines of his country, ſince I perceive he is both curious and intelligent in thoſe matters. What he mentions to you about the ſubſtance he lighted on, that changed conſiſtence & eaſy, I am prone to believe, both upon his word, and upon an experiment I made, though not altogether the ſame way, with fixed nitre and diſtilled vitriol. I look alſo upon what he delivers as a more general obſervation to be ingenious, but I doubt it will admit of ſome limitations, ſince I remember not to have found red integrated nitre near ſo fuſible, as his ſuppoſition requires it ſhould be. Your hint about the uſe of it in thermometers is rational; but we have other ſubſtances, that perform the ſame thing at leaſt as well. The mention of heat puts me in mind of a paſſage in your former, about the way propoſed for the hatching of eggs, which brought to my remembrance, that I once attempted an odd way of ordering eggs, whereby I brought ſome of them to animation, and one or two of them a great deal further. The way I could not then proſecute, but did deſcribe it in one of my yet unpubliſhed eſſays. I have been, before the laſt week, beginning ſome trials about the air, which, if it pleaſe God I have opportunity to complete them, will not, perchance, be unwelcome to the ſpeculative. For though, for want of accommodations, I was obliged to deſiſt from proſecuting my attempts, yet what I was able to do, will promiſe no ill ſucceſs to,

SIR,

your very affectionate friend,

and very humble ſervant,

ROBERT BOYLE.

I FORGOT to tell you in my laſt, that a gentleman, who paſſed by this way, informed me, that the French *Journal des Sçavans* is tranſlated into Latin, and printed in *Germany*, and that he had bought it. I have newly received, from Dr. *Needham*, a letter addreſſed to you, and which he deſires me to convey to you. This it were not fit for me to decline; but in regard it concerns Mr. *Hooke*, and contains objections againſt ſomething lately publiſhed by him, I preſume you will think it fit, as I do, to ſhew it him, in the firſt place. And ſince they are both ſuch ingenious men, and both members of the Royal Society, it were to be wiſhed, that, if it be poſſible, they may be brought to agree, without making their oppoſition éclater. Dr. *Needham*'s letter ſhall be ſent by the carrier.

LETTERS

FROM

SEVERAL PERSONS

TO

Mr. *BOYLE.*

Moſt honoured SIR,

I WENT yeſterday to wait upon my excellent lady, who was pleaſed to ſhew me a certain letter making mention of me, which I had no ſooner peruſed, but the expreſſions of your very great love were delivered into my hands. Sir, this gave ſuch an alarm (for we are nothing almoſt but alarms) to my affections, that I muſt needs convey the ſound of it to your ears by thoſe paper-wings, which carry alſo along with them a further diſcovery of the office of publick addreſs for accommodations. The office of communications is to follow very ſhortly, God willing, eſpecially in reference to univerſal learning. And if then the truſtees of the kingdom ſhall vouchſafe to look after ſuch ſmall and trivial by-matters, I ſhall aſſuredly be mindful of your kindneſſes, and be perhaps as well in an offering, as in a receiving condition. If they do not, I fear, that my lord *Cottington*, who, as I am certainly informed, was, with a French doctor in *London*, before thoſe troubles began, fully reſolved to have erected ſuch an office, [will] riſe once in judgment againſt them. However, I am more than reſolved to continue in this kind of folly to ſerve the good of many; and worthy Sir *Cheny* profeſſes himſelf to be one, that will join with me in running this race. For in his laſt he uſed theſe very words unto me.—"I offer, if others of our acquaintance will come in, and according as my condition in theſe tottering times ſhall prove, to allow towards the maintaining of one clerk, the ſum of 20*l. per ann.* and ſhall (as God ſhall bleſs me) be ready to encreaſe it, till we can invite the publick to take notice of its own intereſt in the buſineſs." Thus far Sir *Cheny*, which I mention the rather, that it may be ſome incentive to others by your means in your quarters, if any burn with ſuch inflammations. And that you may have the more fuel to put into the fire, I cannot but tender to your favourable hands the other writings here adjoined, eſpecially the deſign of the *Hiſtory of Trades*. The author of them is one *Petty*, of twenty four years of age, not altogether a very dear *Worſley*, but a perfect Frenchman, and good linguiſt in other vulgar languages beſides Latin and Greek, a moſt rare and exact anatomiſt, and excelling in all mathematical and mechanical learning; of a ſweet natural diſpoſition and moral comportment. As for ſolid judgment and induſtry altogether maſculine. This is the meat or banquet, to which I deſire to invite mainly all ingenious ſpirits and diſcerning palates at this time. I know not how the ſauce of it, (which muſt be at leaſt a hundred and twenty pound *per ann.*) will be reliſhed; but when he hath perfected the ſpecimen, which I have required of him, in one trade, (which alſo is near done) and ſet down all the terms and conditions, upon which he deſires that annual aſſiſtance, I ſuppoſe no right taſte will nauſeate it; nay, I am confident to your ſenſe it will be delicacy, and the beſt veniſon, that ever I could have hunted out for you in this populous wilderneſs. Sir, may I be ſo happy as to ſee again ſome lines from your hands, to continue or rather begin a correſpondence, as to the coſmetical (but to my aims truly vital) parts of it; and I ſhall ſtudy to approve myſelf in all thoſe, and all other profitable and real reſpects and obſervances,

Moſt honoured Sir,

your entirely affectionate,

and moſt willing, and obliged

friend to ſerve you,

Lond. Duke's-place, Nov. 16, 1647.

S. HARTLIB.

SIR,

I BEG the ſending of Mr. *Dury*'s Exercitation how to travel profitably in the law. You ſhall have back this money with intereſt, if you dare give me credit for ſo much.

Farewel, dear Sir.

Right worthy Sir and truly honoured,

THE encloſed from Mr. *Worſley* I received on Saturday laſt. The extracts he wrote confidingly to myſelf, but I thought it my duty not to conceal them from your eyes in the very formalia of his words. If I were not very confident, that you would take all in good part, I would never have made over thoſe adventures of my freedom unto you; but owing ſo much to the nobleneſs of your diſ-

poſition, your ſpecial ſervices, and to the moſt faithful friendſhips both of Mr. *Morian* and Mr. *Worſley*, I could truly do no leſs. Sir, I could enlarge myſelf upon many other particulars full of variety, and of a ſpring of pleaſure; but I ſuppoſe Mr. *Worſley* hath preſented to your curioſity a large field to walk in at this time: yet give me leave to preſent you with a poſy of additional lines in the following words. I thank you for your new diſcoveries in anatomy, and enquiries of other uſeful and ingenious knowledges. I ſhewed Mr. *Hobbes* your letter, who liked it ſo well, that he deſired me to lend it him, which I did. Your worthy friend and mine Mr. *Gaſſend* is reaſonable well, and hath printed a book of the life and manners of *Epicurus* ſince your going from hence. He hath now in the preſs at *Lyons* the philoſophy of *Epicurus*, in which I believe we ſhall have much of his own philoſophy, which doubtleſs will be an excellent work. There is an experiment how to ſhew, as they ſuppoſe, that there is or may be vacuum. It were too long to write all the particulars, but in brief thus. They prepare a long tube like a weather-glaſs, which is filled with quickſilver; and being ſtopped as cloſe as may be with one's finger, the tube is inverted and plunged in a veſſel half, or more, full of quickſilver. The quickſilver in the tube will force the quickſilver in the veſſel to riſe, by adding more quickſilver to it, and ſo leaves a ſpace in the top of the tube vacuum, as is ſuppoſed. But a bladder being hung in that vacuum was as perfectly ſeen as could be, ſo that there muſt be ſomebody there to convey the action of ſight to the eye, as I ſuppoſe and divers others here. That bladder was made as flat as they could, when they put it in; and when the quickſilver left it, it ſwelled in that ſuppoſed vacuum like a little foot-ball. Thus far Sir *Charles Cavendiſh* to Mr. *Petty*, who honours and loves you, but not in thoſe dimenſions, as he, who ſubſcribes himſelf always,

Right worthy Sir and truly honoured,

Lond. Duke's-place, in the great open Court, May 9, 1648.

your moſt entirely reſpective and faithfully devoted,

SAM. HARTLIB.

Right honoured Sir,

I HOPE you have received my laſt of the 26th of June, with many extracts of letters of great importance, which I would not have fall into other hands but your own. The letter was directed as this by the favour of *Sherburn*. Here are the continuation of the reſpects from *Amſterdam* and *Duke's-place*, which contain ſome particulars in them worth your trial and animadverſions. One *Evans* in *Fetter-Lane* uſed to ſell antimony cups for 40 ſhillings apiece, if not more, which perhaps coſt him no more than ten ſhillings. I am told they can no more be had, for which I am not much troubled. For I ſuppoſe the antimony cup is no other than a pure ordinary regulus antimonii caſt into the form of a cup, which cup hath no other virtues nor effects than the foreſaid regulus; for this regulus lying in any liquor doth the ſame, which the cup-holding liquor in all reſpects. As for *Vaux-hall*, there is a proviſo put into the act, that it ſhall not be ſold. My endeavours are now, how Mr. *Petty* may be ſet apart or encouraged for the advancement of experimental and mechanical knowledge in *Greſham* college at *London*, of which you ſhall have a true account alſo,

Right honoured Sir,

Duke's-place, July 24, 1649,

from your entirely faithful, and moſt humble ſervant,

S. HARTLIB.

Dear SIR,

YOUR firſt and laſt from *Ireland*, dated at *Youghall* the 10th of January, 1653-4, I received yeſternight, very late. The 30th of September anſwered your's from *Briſtol*, but do not perceive, even by this, whether the ſame packet did ever come ſafely to your hands. I ſhould not have failed to perform my promiſe of writing, as I was really reſolved to do it every week, if yourſelf had not been in fault. For my promiſe was grounded, as you remember, upon your firſt writing from *Ireland*, which was never received till now: beſides your deareſt ſiſter was ſo diſcouraged, having ſent ſeven or eight letters, to which ſhe had gotten no anſwer, that ſhe was more than inclining not to write any more unto you. I cannot alſo but remember, with what reſolvedneſs you promiſed to be back again in *February*, or ſooner; which now being paſt, you ſee, upon your intimation of a longer ſtay, how ready I am, without the interpoſal of one day, to fulfil, in ſome meaſure, all your deſires and expectations; I ſay in ſome meaſure, for there are ſome things fallen out ſince your departure, which it is not lawful to utter by writing, but are as certainly your's, as thoſe that do poſſeſs them, as ſoon as God ſhall afford a fitter and more certain opportunity. For my lady tells us, that ſhe expects ſhortly another letter from you by a ſhip, which is to let her know, how your poſture ſhall be ſtated, for coming or ſtaying; which will alſo direct us how to carry ourſelves in our communications for the future. But O! that it would pleaſe God to order your affairs in ſuch a manner, that you could be with us before ſo many months be expired as you have calculated, according to the Iriſh account! We expect every week to hear more from *Johannes Baptiſta Coen*, who hath been a great while with *Faber*, that famed pretender in *France*, but is now at *Diepe*. It is not impoſſible, but I may tell you in my next, God willing, that he is not far from the place, where once Char-

ing-croſs did ſtand. Some months ago I received a letter from Mr. *Worſley*, in theſe words, among other particulars. " I wrote to you, " a while ſince, and in it took the boldneſs " to write to monſieur *Clod*, in which you " muſt deal plainly and honeſtly with me, if " I took too much liberty or freedom in aſk- " ing his opinion, about a matter of ſo much " judgment and weight. For the truth is, " I have laid all conſiderations in chemiſtry " aſide, as things not reaching much above " common laborants, or ſtrong-water diſtillers, " unleſs we can arrive at this key, clearly and " perfectly to know, how to open, ferment, " putrify, corrupt and deſtroy (if we pleaſe) " any mineral, or metal; which being with- " al not indeed to be done, unleſs by one, that " diſcerns the nature very well, I preſume it " is therefore ſaid, it is eaſier to make ſome " metals, than to deſtroy them. Not that I ap- " prehend it is to be underſtood, the work is " eaſier, to make a metal, than to deſtroy it; " for that were impoſſible, ſeeing a natural " putrefaction and corruption is the firſt thing " in order to be done towards the making, " tranſmuting, or multiplying of any metal. " But I conceive the meaning rightly to be, " that a man once knowing how to corrupt " or deſtroy a metal, it is then nothing near " ſo difficult, for him to proceed further, and " to make a metal, as it was at firſt, or is now " generally to men, to underſtand, how they " ſhould begin to deſtroy a metal. In this " therefore, both principally and only, I con- " ceive learning, judgment, or wiſdom to " conſiſt, either as to the knowledge of true " medicine (other preparations ſhort of this " being not much to be valued) or as to the " carrying on of a higher work in nature. " And being led by ſome ſerious conſiderati- " ons to ſee the neceſſity of this (and the " ſmallneſs of moſt chemical operations be- " ſides this) the ſame hand of goodneſs did " diſpoſe my mind to comprehend both the " poſſibility, and ſomewhat of the way of " it, and nature of the courſe concerning it, " which I confeſs did provoke and occaſion " that freedom with monſieur *Clod*; as re- " ſolving not much to prefer a correſponden- " cy of any hands, in things chemical or me- " dicinal, unleſs this, as I either may be an " aſſiſtant towards it, or be aſſiſted in it. " And although I may ſay, I ſee already ſo " much in it, as to prefer it before any other " natural knowledge, or, perhaps, employ- " ment; yet I can find nothing very valuable " or very deſirable, either in myſelf, or others. " And when I have once a while conſidered " things, I find myſelf as much inclined to " fear or ſuſpect them, as I do to wiſh them." Thus far that noble and high ſoaring ſpirit, which I thought good to repreſent unto your better conſiderations, which you ſay are engaged, for the preſent, in a ſhort eſſay concerning chemiſtry, by way of a *judicium de chemia & chemicis*. As for us, poor earth-worms, we are crawling in my houſe about our quondam back-kitchen, whereof my ſon hath made a goodly laboratory; yea, ſuch a one, as men (who have had the favour and privilege to ſee, or to be admitted into it) affirm, they have never ſeen the like, for its ſeveral advantages and commodiouſneſſes. It hath been employed days and nights with no ſmall ſucceſs, God be praiſed, theſe many weeks together. But what particulars it hath hitherto produced, and what greater medicines he is taking in hand this week and the next, I ſuppoſe this my obedient and very chemical ſon will be able better to relate unto you, than myſelf. I could wiſh the like account could be given of Dr. *Stirk*, but he is altogether degenerated, and hath, in a manner, undone himſelf and his family. I know not directly how many weeks he hath lain in priſon for debt; but after he hath been delivered the ſecond time, he hath ſecretly abandoned his houſe in *London*, and is now living obſcurely, as I take it, at *Rotherhith*. He hath always concealed his rotten condition from us; nor hath there been any communication between him and my ſon, as long as you have been in *Ireland*. Mr. *Webb* doth now rail at him and curſe him, as having been moſt wretchedly ſeduced and deceived by him. Many weeks ago he promiſed me to write diligently unto you, but hath never ſent one letter ſince your going from hence. I hear there are ſecret tranſactions between him and my lord *Dover*; but I am afraid they will all vaniſh into ſmoke. When God hath brought you over again, we ſhall leave him altogether to your teſt, to try whether yet any good metal be left in him, or not. But the beſt is, that he ſtands more in need of us, than we of him. I am glad that ens Veneris hath done ſo much good in *Ireland*. My ſon, and many others, can tell you of the ſtrange vertues and effects, which his laudanum hath already produced among us here. The courſe, which you have purchaſed of your excellent ſurgeon, to cure the ſtone in the kidnies, will be very welcome, whenſoever you ſhall ſend it. After thoſe great and moſt univerſal arcana are prepared, my ſon, both for your and my ſake, will ſet himſelf on purpoſe, God bleſſing his endeavours, to perfect thoſe other Helmontian preparatives concerning the ludus with the ſal armoniack. I need not tell you again (for I hear, that you know it already) that Dr. *Boat*, when he was come as far as *Diepe* towards *England*, being let blood by thoſe common butchers of human kind, departed this world; which really is a very great loſs to the commonwealth of learning. In his laſt, of the 18th of October, 1653, he wrote unto me as followeth: " Pray preſent my humbleſt " ſervice to Mr. *Boyle* and S^r. *C. Culpepper*; " and tell the firſt, that here is newly come " forth a *Treatiſe des arbres fruitiers* (which, " God willing, I ſhall bring him, with the " reſt of that ſubject deſired by him) and the " other, that in all *Paris* there is not to be " had one grain of Lucern ſeed, not only of " this, but not ſo much as of the laſt year's " growth." Thus far that bleſſed ſoul. I make no queſtion, we ſhall find that treatiſe in *Paul*'s Church-yard; or it may eaſily be procured

procured with the reſt from *France*, if you will let me know the particulars of that commiſſion, which you imparted to the late doctor. But how to gain another treatiſe, deſigned by the foreſaid worthy man, upon my moſt earneſt ſolicitations, I am utterly at a loſs, except Dr *Child* from *Ireland* ſucceed him in the purſuit of that weighty ſubject. For having dealt much with him, about the completing his *Natural Hiſtory of Ireland*, by procuring that encouragement, which he demanded, he was pleaſed to encourage me again with another undertaking, in theſe words:

" You may encourage our friends to do as " much by me for to ſet me on work about " another (beſides the perfecting of the *Na-* " *tural Hiſtory of Ireland*) production, viz. " my intended book of the whole nature, " intrinſical qualities, preparations, and all " manner of uſes of ſaltpetre; a natural body " of too noble a nature, and too univerſal uſe, " for to be ſo much neglected, and unknown, " as hitherto it hath been. I have not ſo much " as begun that work yet, but having all the " materials ready for it, *partim in chartis & par-* " *tim intra caput*, a few months at any time " will ſerve my turn, for to give it its being."

In the mean while, receive here that ſpecial, ſecret and ingenious ſpeculation of my friend, the great experimenter, of whom I told you lately, in the very words, wherein I ſet it even from his mouth, being as followeth. " Hav- " ing been told, that one Mr. *Jurſang* and " monſieur *la Grange* here gave out, to have " found out a way to make ſaltpetre grow, " but that they would not diſcover it under " ten thouſand franks, he ſet his wits at " work, for to find out the way, and made " no doubt but it might be done thus: viz. " Taking a parcel of good ground, well dig- " ged and well manured with dung, as for " the richeſt corn, a cover is to be made over " it, for to exclude the ſun, and to hinder " the growing of any herbs (which would " hinder the growing of ſaltpetre) and then " to ſow ſaltpetre on it; which might moſt " commodiouſly be done, by diſſolving it in " water, and throwing the water on the " ground. The proportion he thinks to be a " pound of ſaltpetre for a foot ſquare of ground; " after half a year, you may pare away half a " foot deep of your ground, and half a year " after another half foot, and ſo from time to " time, and you will have an everlaſting " mine of ſaltpetre; and the deeper you " come, the better it will be; but if at firſt " you ſhould pare it too deep, and cut away " too much, you would mar all. After the " paring away of the upper cruſt, the ground " muſt ſtill be digged afreſh." Thus far my friend's invention. *Hactenus ille.* The latter paſſages of the ſecret I have added, being deſirous to have that deſcription concerning the Hamburg ſaltpetre (whereof you may inform yourſelf again from Mr. *Van Muſſig*) under your own hands. But to return to the remaining contents of your letter, I muſt now moſt ſolemnly call upon you, on the behalf of the *Natural Hiſtory of Ireland*, which, if yourſelf and Dr. *Child* do not take profeſſedly to taſk, I fear will never be perfected to any purpoſe; at leaſt, if ſo much could be done in it, as to have all the interrogatories judiciouſly anſwered (of which, God willing, I ſhall ſend you more copies) it would be a conſiderable addition to a ſecond edition of this imperfect work, which I formerly have publiſhed. I pray therefore, Sir, do not fail to give or procure me as ample an account, as poſſibly you can, concerning this affair. As ſoon as I have made an end of this letter, I purpoſe to ſend for thoſe Arminian books, which you have deſired. If they may be had, the interrogatories ſhall be ſent in the ſame packet with them, according to your direction. I am ſorry, that the tranſplantation of the Iriſh ſhould be that diſmal occaſion of your ſtay; but my comfort is, that you may get far better tenants, and that could not be ſo eaſily ſwept away, as thoſe other, if you had but ſo much faith and courage, as to adventure yourſelf amongſt us, and to let us enjoy your preſence with all convenient expedition. I confeſs, the tranſplantation of thoſe many governments have ſwept away alſo almoſt all my tenants, that I cannot do, that which otherwiſe I had more largely intended. But my hopes and confidences towards God are ſtronger than ever, that my lands ſhall not always lye waſte upon my hands. Sir, you complain of that barbarous (for the preſent) country, wherein you live; but if you would but make a right uſe of yourſelf, from the place where you live, towards Dr. *Child*, Mr. *Worſley*, Dr. *Petty*, major *Morgan* (not to mention others) they would abundantly cheriſh in you many philoſophical thoughts, and encourage you, perhaps more vigorouſly than I can do at this diſtance and uncertainties, to venture even upon divers choice chemical experiments, for the advancement both of health and wealth. And if *Stirk* ſhall continue his ungrateful obſtinacy, yet give us but more certain aſſurance, either of your ſtaying or coming, and we ſhall endeavour to fraight our letters with many Utopian intelligences, to expreſs, at leaſt, this way the very good will which we bear towards all manner of ingenuities. If Mr. *Dymock* knew, that I was writing into *Ireland*, I am confident, he would preſent his moſt humble ſervice, with his gratitude for former favours, unto you. He is forſaken, in a manner, by all, and the lower, for the preſent, becauſe I cannot any longer aſſiſt either his perſon, family, or inventions. By the laſt poſt I received an unexpected letter from the Scottiſh lord *Forbes*, in theſe very lines. " Having newly ſeen " three ſmall pieces, one called, *An Invention*; " *&c.* another, *The reformed Huſbandman*; the " third called, *An Eſſay for Advancement of* " *Huſbandry Learning*; I perceive you are ſtill " the old man, and your inceſſant endeavours " to advance a publick good is never wanting, " though ſuch be many times miſregarded, " and not rewarded. Since it is my lot to be " here, where I have been ever ſince I did

" come

" come from *England*, by that act of baniſh-
" ment, and reſolves, God willing, to ſtay
" here, till it pleaſe God to ſend better times;
" out of the acquaintance I have formerly had
" with you, I am bold to entreat you to ac-
" quaint me what effect thoſe three treatiſes
" have taken; and if they be practicable,
" communicate your knowledge with your
" old friend. But if, for lack of patrons,
" ſuch talents lye ſo long hid, if the gentle-
" man, that writes to you, or any inſtructed
" or taught by him, will do me the favour
" to come hither to *Sweden*, I will find him
" patrons, that will afford him a plentiful
" maintenance." The letter is dated at *Stockholm*, the 21ſt of Jan. 1654. I ſhould be willing to part with him into *Sweden*, or any other place, which he could fancy: as to his invention of motion, of which I am no more ſo fond as I was wont to be. Not that there is any defect in the ſaid invention, but, according to the ſaying of *Terence*, *Tædit harum quotidianarum formarum*, there appearing a far greater beauty and perfection in ſome other inventions of the ſame kind, which are going through my hands at this preſent; of which I ſhall be able to give you a more particular account ſhortly, there being already a reference made by his highneſs, for a patent for 14 years. But that other part of his publick and private uſefulneſs, as to all the parts of huſbandry (I ſpeak ſtill of Mr. *Dymock*) is now the more to be regarded, and deſerveth far better to be cheriſhed and ſupported, than hitherto it hath been. Yet I hope he ſhall not need to go into *Sweden* for patronage, if God bleſs thoſe other natural, chemical, or mechanical ingenuities, in which our confiding friends are ſo deeply engaged. The huſbandry directions about clover, here encloſed, I got from my lord *Brereton*'s eldeſt ſon, who obtained them once from colonel *Goring*, as I take it. The other experiment, or the offer of it, came from *Hamburg*, and is tranſlated into Latin; and thoſe other animadverſions, for your ſake. I hear there is one Mr. *Haughton*, a gentleman, that lives in *Norfolk*, who hath for many years ſince uſed the huſbandry of clover-graſs, and hath an eaſy way, by the help of a kind of mill, to ſhell the huſk from the ſeed, whereby his ſeed will not ſtand him in above two ſhillings per pound; which otherwiſe is ſold in *London* for eight, ten, twelve, and ſixteen ſhillings. There is alſo a Dutchman, one Mr. *Bedloe*, for the preſent at *Amſterdam*, who promiſeth to furniſh huſbandmen with a liquor, for imbibing of ſeed-corn, whereby the ſeed, being ſown in the moſt barren ground (ſo it be freſh) ſhall produce as rich a crop, as the ſame quantity of ſeed would have done in the beſt prepared land, according to the uſual courſe of huſbandry; and the land ſhall continue to yield ſuch crops for twenty years together, without any amendment or manure, than what may come from the ſeed thus imbibed. The charge of the liquor will not be above twelve ſhillings for a buſhel. A gentleman of *Wales* (Mr. *Kemeys*) is ſaid to have ſown laſt year four acres of wheat in barren land, imbibed with the ſaid liquor, of which I am promiſed a fuller relation in due time. In my late publiſhed treatiſe, which I ſent you, concerning diviſion of land, *&c.* there is an experiment, or ſecret, tranſlated into Engliſh, which runs thus in the original.

Frumentum eligatur ponderoſum & maſculum. Hoc enim ſolum in terram tanquam faminam conjectum, vim generationis habet. Hoc ita electum imponatur in aquam ſimi equini pinguem & fætidam, in qua tot libræ ſalis terræ, quot jugera ſeminanda erunt, diſſolvantur, maceretur per 24 horas. Hoc ſi fiat, media frumenti ad ſementem pars ſufficiet, aratri duntaxat unius labor, neque ulla ſtercoratio neceſſaria erit etiam in terra ſterili. Frumentum inde uno ante meſſem menſe matureſcet, & ob ſalis terræ commixtionem, decennio conſervari poterit. Te hortor, ut porro huic negotio inſiſtas ac promoveas hoc Ceriale artificium. In the forementioned treatiſe you will ſee, how highly Dr. *Child* doth eſtimate this experiment. Since I have received a further enlargement upon it thus. *Nunc de ſeminum maceratione, cui ego multum tribuo, id addo, ſummopere cavendum ne in aqua calida multo minus ad ignem, macerentur & coquantur. Retulerunt mihi harum rerum gnari omnem vim ſeminis & fertilitatem perire, ſi coquantur, vel etiam aqua calidiore macerentur. Cauſam illi ignorabant. Exiſtimo autem hanc eſſe: virtus ſeminalis in ſale conſiſtit. Hic ſal liqueſcit & reſolvitur, adeoque aquæ calidæ miſcetur, unde granum ſale caſſum moritur. Quod ſi in illa aqua, cui grana incocta ſunt, poſtquam refrixit, recentia grana macerentur, attrahent ex aqua ſalem incoctum, & virtute creſcent. Unum enim granum ſal multorum, vi magnetica, attrahet. Unde etiam patet, cur grani-voracium ſimus ad fertilitatem commendetur, ſicut tu olim recte in tuis, quod vita media vegetativa & ſeminum in ſtercoribus illis reſtitet exaltata. Unde grana aliquo aeris vitio corrupta non ſunt abjicienda, etiamſi enim non conducant ad victum, tamen excocta vim ſuam reddunt aliis granis, æque macerata multiplicant.* Thus far learned Dr. *Horne*, profeſſor at *Harderwick*, who hath been lately called to *Leyden*. Sir, I thought to have taken my leave here of you, but that ſomething extraordinary of butter and cheeſe is brought to my hands, to entertain you withall. That is, how to make a better ſort of butter, without ſetting the milk for cream, practiſed with great approbation by Mrs. *Child*, in the iſle of *Ely*. The milk, ſo ſoon as it is come from the cow, muſt be ſtrained then churned; as uſually cream is done. Alſo the cheeſe made of the butter-milk will be better than the beſt two meal cheeſes, that ever was eaten. And one pound of this butter ſhall be worth a pound and a half of your beſt butter, which is made of cream. My poor wife hath been ſick unto death, but, by God's bleſſing upon the laudanum, the ſtrength of her diſeaſe was broke within leſs than three hours after once taking of it, which none of her kindred would have believed. She remembers her humble ſervice, with the reſt of her daughters and ſons. Sir *Cheney* complains more than ever, that his father hath utterly undone him.

If

If you find no letter here from my ſon *Clodius*, you muſt lay the blame upon the ſmith's ſhop in *Martin's Lane*, where he hath been all this day, with another workman, to prepare ſomething, which is to be an ingredient in that noble medicament of the Helmontian cinnabar, which he hopes to have in readineſs, if God permit, in leſs than three weeks time. But by the next poſt you may expect a large letter, in anſwer to your kindneſs, from his hands. The printed paper, here adjoined, was preſented, without any effect, to the publick truſtees of that affair. If the adder will not hear, yet, methinks, it is ſome comfort, that the charmers have charmed wiſely. I remain now and ever,

Dear Sir,

Charing-Croſs, Feb. 28, 165$\frac{3}{4}$. your moſt entirely devoted friend and ſervant,

SAM. HARTLIB.

MY moſt humble ſervice to the earl of *Corke*, and the lord *Broghill*: alſo to Mr. *Van Muſſig*, if he will be friends with me. I have not time to read over what I have written.

Dear SIR,

I PERCEIVE, by your laſt moſt welcome letter, of the 25th of April, that all my three former letters are ſafely arrived to your hands: your intended ſtay till the 24th of June is ſuch a paſſage, as pierces my ſoul, for divers very weighty reaſons and conſiderations, which is but bootleſs to name for the preſent. Nor dare I entertain your departing again from *Dublin* with any delight or ſatisfaction, in reference to our communications, which might have been more readily exchanged, if you had continued in that central place. But we muſt quietly ſubmit to a wiſer providence, than we can ſet up by our own deſires or affections, though never ſo ardent and ſincere. I hope you have received likewiſe the great packet, with the deſired Arminian books, which could hardly be gotten at the ſecond hand. The monies, which I laid out for them, I received again, according to your appointment. If I ſhould have apprehended ſo long a ſtay as to the 24th of June, I would have added ſomething elſe to the foreſaid packet, beſides five copies of the deſired interrogatories; to divers of which I have procured a ſufficient anſwer. It would much further that deſign, if every ingenious head amongſt you would take notice of whatſoever worth the obſervation occurreth in any place, that ſo by little and little we might perfectly come to underſtand the natural hiſtory of all the parts in that country. There are ſome things worth a philoſophical pen in theſe places, *viz.* How it cometh to paſs, that there are not frogs, toads, ſnakes, neither moles nor nightingales, rarely magpies? How ſome kind of fowls and beaſts we have not in *England?* as divers hawks, cocks of the wood, pintails, wolves, foxes, greyhounds wondrous large; as alſo divers plants and fiſhes. Farther, to enquire what truth there is, concerning the generation of barnacles, which much abound there. As alſo of divers things, which the Iriſh fooliſhly report of St. *Patrick*. Alſo it were worth the while, ſtrictly to examine their petrifying fountains, which are ſaid to abound in ſeveral parts, whether they tranſmute all woods, or only holly, as is commonly reported? Whether turf doth grow here much, and how? Alſo, concerning divers iſles, in one of which it is reported, a dog will not bite, and a woman cannot have children in. Alſo of lakes, ſome of which are accounted bottomleſs; another, at certain times, caſting forth yellow amber. Alſo concerning ſtones like birds, which, they ſay, St. *Patrick* turned into ſtone, for chirping when he was preaching. I am glad to hear, that Mr. *Worſley* alſo is like to engage in the proſecution of theſe affairs, and this kind of ſurveying of lands. Concerning the clover huſbandry, I am promiſed a ſpecial account, which you ſhall have, God willing, as ſoon as it comes to my hands, either in print, or a copy in writing. There is another renowned ſeed in *Brabant* and *Flanders*, which is as little taken notice of as clover was, before my books were divulged; it is called in Latin *ſpergula*, and in Engliſh ſpurry-ſeed; of which one writes unto me, as followeth. "The ſpurry-ſeed, which you have gotten "out of the low, grew, no doubt, in light "ground: and, accordingly, if it were mine, "it ſhould again be ſown in the lighteſt "ground I had; though, for trial's ſake, I "might, perhaps, beſtow a handful or two "upon every ſort of ground near me."

THE times of ſowing it are twice in a ſummer: the firſt time is not very early. I ſhould not adventure to ſow Dutch ſeed in *England*, before the middle of May, leſt being a ſtranger, it ſhould take it unkindly to meet with cold May mornings, and diſcourage me. In June and July it will be in flower, and in Auguſt the ſeed is uſually ripe. The ſecond time of ſowing is after hay-harveſt, when the *Brabant* huſbandman preſently ploughs up his ground, and ſows it with ſpurry-ſeed, that it may grow up, and ſerve his kine after all the late graſs and rowins be eaten up, even till New-years-day: ſo that this latter ſowing yields no ſeed, but is eaten up green, and the proviſion for ſeed is made by the former ſowing.

IT will be good in this firſt trial, to ſow it in ſeveral parts of the ſame ground, in different proportions, and to mark, which thrives beſt. As alſo, in the ſame ground, and with the ſame proportion of ſeed, to try the difference of encreaſe there is between the ſeed newly threſhed out, and thrown into new-ploughed ground, and that ſeed, which is at the ſame time a year old.

IT is ordinary in *Brabant*, to ſell away their May-butter, and to make their winter proviſion for themſelves, and their more

knowing cuſtomers, in the end of the year. For many of them prefer ſpurry-butter before May-butter. I ſuppoſe, the principal reaſon is, becauſe it is not ſo apt to grow rank, with that ſummer-heat, which May-butter muſt endure in June, July and Auguſt.

I HAVE known ſome *Brabant* huſbandmen ſow Kolls, that is, ſmall round turnips, among their ſpurry, in the latter ſeed-time, as being alſo good to encreaſe the milk in their kine.

SOME *Brabant* women give ſpurry to their hens, that will catch it from one another as they do chick-weed: they believe, that it makes them lay the more eggs. Spurry is by ſome eſteemed a ſure remedy for a cut, or green wound, if it be bruiſed green, and laid to the cut. Thus far of ſpurry-ſeed. I could give you likewiſe ſeveral accounts concerning la Lucerne, and St. Foyne; but my legacy of huſbandry being to be printed the third time, you ſhall find them all in that edition with the Anſwer of the late Dr. *Child* to the animadverter, Dr. *Boate*, upon his large letter of huſbandry, wherein there are divers excellent obſervations and experiments, which, by God's bleſſing, are like to enrich theſe nations, if their induſtry be not wanting. By that, which I read concerning Dr. *Child*'s huſbandries in the work of *Ireland*, I ſee what a good foundation of life he hath laid for that honeſt country calling. But I doubt the colonel cannot ſhew us any more obſervations or directions of his in writing, beſides what is extant already from his hand; though this would have improved clover, flax and woad, upon many more lands than his own. I have heard no more from Dr. *Horne*, ſince I have ſent him a pretty bulk of all ſorts of books. I ſuppoſe, he will give his judgment upon thoſe, that treat of this ſubject, as ſoon as he is ſettled at *Leyden*, whither he is called to the profeſſorſhip of hiſtory, in *Salmaſius*'s room, as I take it. I have ſeen lately a French book, much commended unto me, called, *Le Jardinier François, qui enſeigne a cultiver les arbres & herbes potageres. Avec la maniere de conſerver les fruits, & faire toutes ſortes de confitures conſerves, & maſſepains. Dedié aux Dames. Seconde edition. A Paris* 1651. Perhaps, this alſo was amongſt the books, which Dr. *Boate* commended for his georgical catalogue. I long to hear more news of that ingenious gentleman, between *Youghall* and *Dublin*, for advancement of theſe rural ſtudies. I like ſo well his character already, which you have given him, that I am much inclined to preſent him with ſome of theſe kind of books of mine, that they may be improved and enlarged by his pen, both from his great travels in the eaſtern countries of the world, as likewiſe from his eminent huſbandries in *Ireland*. The way to have roſes twice a year, is very pleaſant and fragrant, if it be ſo practicable, as you have deſcribed. For the lord *Digby* would ſay, ſpeaking of an ancient fair lady, that a roſe in Autumn was as ſweet as a roſe in June. But better travellers and naturaliſts relate, that the planting of roſes is but a late attempt in the *Weſt-Indies*, where they never grew afore; yet ſince they have been planted there, they have proſpered exceedingly, in a moſt ſurpriſing nature, for ſight and ſmell, above all our roſes. I am ſhortly to be acquainted with Mr. *Marſhall*, the great maſter of inſects in all *England*, as likewiſe of the planting of above thirty new ſorts or kinds of roſes, which are ſo lively and accurately repreſented, that three hundred pound ſterling hath been offered for that picturary, if he would have ſold it. The performance of Dr. *Van Muſſig*'s promiſe concerning ſaltpetre will be very welcome: but, not taking notice of this, I pray remember my true love and ſervice unto him. If he have any buſineſſes or commands to honour me withall, you may aſſure him, I ſhall approve myſelf always his ancient faithful friend and ſervant. The author of *Iſagoge Phytoſcopica* is Dr. *Jungius* of *Hamburg*, one of the beſt logicians in all *Germany*. For he conceives, if that art were truly underſtood and applied, not only botanical, but all other real ſtudies whatſoever, would flouriſh more than they have done ſince the fall of *Adam*. *Leges Collegii Protonoetici* came from the ſame forementioned author: but they will ſcarcely be underſtood, without the general draught of his philoſophical undertakings, which I ſhall impart unto you hereafter, God willing. In my laſt to Mr. *Worſley*, I gave him the contents of a certain treatiſe, called, *Viridaria Varia Regia & Academica publice in uſum magnatum ac philobotanorum collecta ac recognita opera & ſtudio D. Simonis Pauli S. R. Daniæ Andrei Aulici, Hafniæ* 1653. *In quo continentur*, 1. *Catalogus plantarum horti regii Hafniæ.* 2. *Pariſienſis.* 3. *Warſavienſis regis Poloniæ.* 4. *Oxonienſis.* 5. *Gymnaſii Patavini.* 6. *Horti academici Lugduno-Batavi.* 7. *Horti Groningenſis.* 8. *Catalogus tuliparum.* 9. *Laurembergii Botanotheca. Hoc eſt, modus conficiendi herbarium vivum.* All in one thick volume, in great 12mo. There came over but two copies only from *Denmark*. But a judicious friend of mine writes his cenſure upon it in theſe following words.

—*Viridaria regia Sim. Pauli perſuadeo mihi opus eſſe ad pompam verius quam ad uſum: cui bono quæſo variarum iſtarum plantarum nomenclatio, ſi certior earum et fundatior deſcriptio abſit? Et licet ejuſmodi nobis poteſtas, quemadmodum in prolixa horti Eichſtedenſis deſcriptione atque in herbariis præprimis nonnullis (puta Matthioli ſola ſe figurarum elegantia inſinuantibus) eſt videre, quid tamen præter inanem oculorum voluptatem lectori adferunt ſolidi? Niſi forte nobis una virtutes vireſque in cibo, potu, aliiſque diſtinctius et accuratius explicent? Sed quî hoc mihi pollicear de uno homine? niſi ut quis ſcribere libros animum intendat, & nobis denuo apponat, quod cum tædio ſumptum eſt. Unam unus medicus herbam deſcribat; res difficillima in mitiorem cogetur naturam, & ſic aliquando pleniſſimum rei botanicæ ſyſtema habebimus. Imo praxis reſpondebit theoriæ quam proximè, et erit chymico bono cui fidat in poſterum. Hodie aliud nihil quam ſcribunt & exſcribunt botanici, rariſſime*

me quod docent, quod ipſi experti ſunt, ut minoris merito emolumenti ingentia noſtra herbaria ſint. Verum eſt alicubi extant certa medicamina & infallibilia, ſed illapſa ſunt multis dubiis aliis quaſi involuta, & nequit nemo docere veritatem illuſtrius, quam quem ipſa fideliter docuit. Sed de hac re eſto domini Clodii judicium. Thus far a very learned friend, which agreeth with your judgment, which you have expreſſed upon this matter. I thank you for the intelligence given me of my lord of *Leiceſter*'s inoculating practices. I ſhall take more notice, from henceforth, of that garden for theſe, and his other pleaſant and profitable civilities and cultures. If we could have a true and faithful deſcription of all theſe kind of induſtries, which have been, with very vaſt charges and exquiſite ikill, beſtowed upon the famed duke of *Holſtein*'s garden, it would teach us yet more botanical and oeconomical leſſons. If I might be ſo bold, I ſhould be glad to know, what other curioſities Mr. *Worſley* hath communicated to you, beſides the moſt unprocurable part of *Glauber*'s ſecond furnace. Mr. *Morian* writes no more of him, or his other promiſed magnalia. A great abbot in *France*, intimately correſponding with Sir *K. Digby*, is ſaid to have other kind of furnaces than any of *Glauber*'s, which will be erected, ere long, amongſt ourſelves, to proſecute really philoſophical ſtudies. For you muſt know, that a general chemical council, not far from *Charing-croſs*, ſits often, and hath ſo behaved itſelf hitherto, that things ſeem now to haſten towards ſome ſettlement; and we, poor and ſickly creatures, begin to conceive hopes of being able ſhortly to ſupport our burthens. As for Mr. *Clodius*'s philoſophical wonders, if they were in my hands, or poſſeſſion, you ſhould ſoon be an eye-witneſs of them, though you were at this diſtance. But my chemical ſon aſſures me, they are fitteſt to be reſerved to that happy converſation, which is ſo much prayed and longed for on both ſides. In the mean time, though the great medicinal arcana be not yet prepared, he hath done, with God's bleſſing upon certain ſpecificks, ſo many and ſtrange cures already, as are counted no leſs than miraculous; or, to uſe Sir *Kenelm*'s words, conjuring. They are about an univerſal laboratory, to be erected after ſuch a manner, as may redound, not only to the good of this iſland, but alſo to the health and wealth of all mankind. I ſuppoſe you have heard, how that Sir *Kenelm* is in very good favour with the lord protector; his ſequeſtration is taken off, and as ſoon as he hath gotten his lands into his own poſſeſſion, (which will be ſuddenly) he ſpeaks of engaging ſix or ſeven hundred pounds for his own part in the foreſaid laboratory, beſides ſome other friends, which he can procure. He proteſted ſeriouſly unto me, that in all his travels and converſes with the choiceſt wits, both in Italy and France, he hath not met ſo much of theoretical ſolidity, and practical dexterity, both together, as he finds in my chemical ſon; and therefore is reſolved to improve that prize accordingly, which providence hath brought to his hands. He hath many excellent ſecrets and experiments of all ſorts, yea, ſome arcana of the higheſt nature, which he hath already freely (yet *ſub fide ſilentii*) imparted into his breaſt; and is purpoſing to ſend for all his papers out of *France*, that he may put them into his cuſtody and management. Both their judgments and experiences agree mightily together, to the very amazement of each other. And there wants nothing to the perfecting of the grand deſign, but that you are not preſent with them, without whoſe intereſt we have no mind, that it ſhould be conſummated. In the mean time, he hath been inſtrumental to ingulph my ſon with the practice of phyſick into ten or twelve families of the greateſt of his acquaintance, which take up ſo much already of his time, both day and night, that he hath no leiſure to devote himſelf to your ſervice, and deſires of correſponding with you, or making out of the better ſort of phyſicks, with ſome of the much deſired and longed for arcana. He hath written for an expert ancient old laborant, which hath lived with Mr. *Morian*, who is like to be here very ſhortly, now the peace between both commonwealths hath been proclaimed ſo many days ago. The laborant alſo is very much commended for his mineral ſkill in divers reſpects. My ſon aſſures you, that he will not fail to prepare the ludus after *Helmontius*'s way, as ſoon as it is poſſible. The rare medicine for curing the gout is yet but extant in the recipe or proceſs, which Mr. *Morian* got from *Coen*, and hath ſince communicated to Mr. *Clodius*, who promiſed to ſend ſome other medicines, which are ready, by the firſt occaſion, as you have directed. The famous lithotomiſts courſe for the ſtone is very welcome, but is counted no great jewel by my ſon. Sir *Kenelm* commends hugely the medicine of the *virga aurea*, which *Barcleius*, in his *Euphormio*, hath ſo remarkably diſcovered to the world, though little taken notice of, in compariſon of thoſe few, which have uſed the ſame with admirable ſucceſs. I am now endeavouring to get the ſight of the forenamed book, and, by my next, God willing, you ſhall have a tranſcript of it. The greateſt ſecret you ever knew in ſurgery, which you mention, as imparted and encloſed in Mr. *Clodius*'s letter, was not found in it. I hope it is not otherwiſe miſcarried. That of the lithotomiſts to me, was found in the company of your deareſt ſiſter, which ſhe faithfully delivered unto me, not knowing how it was come into the letters written to herſelf. I beſeech you, Sir, do not forget to ſend in your next the forementioned ſecret, with thoſe other chirurgical rarities, which you have made a ſhift, as your phraſe is, to poſſeſs yourſelf of. The rare chirurgical ones, which I have purchaſed of late, are contained in the adjoined printed paper of Mr. *Morian*'s communication, which Mr. *Van Muſſig* can interpret. The chirurgical ſeveral oils, therein mentioned, are ſent unto me by the forenamed laborant; of which I

ſhall

ſhall give you farther notice, when they are arrived. The peace with the Hollanders doth no leſs rejoice us, than it doth thoſe nobler ſouls in *Ireland*. To further the philoſophical commerces therefore, in ſome meaſure, I am intending ſhortly to write to the poſſeſſors of the late Dr. *Boate*'s papers, to publiſh thoſe in print beyond the ſeas, which contain the Natural Hiſtory of *Ireland*, written in Low-Dutch originally, as he told me in his life-time. For I ſuppoſe, this may be one means, whereby *Ireland* may be peopled again, and get good tenants; eſpecially, if the other parts, which are wanting to that hiſtory, were more particularly diſcovered and deſcribed. *Coen* hath neither *England* nor the *Low Countries* made happy by his laſt viſits. For Mr. *Morian* hath written twice, that he is arrived at *Hamburgh*, where he hath found, that other *Faber*, which was before engaged in ſome mineral and chemical works. But ſince they have been together, the good man at *Amſterdam* complains, that both of them have been (to uſe his own words) *magis muti quam piſces*. If he knew, that my ſon hath lately gotten from ſome other hand his greateſt myſtery, I dare propheſy, he would not be ſo long ſilent and ſuſpenſe, as hitherto he hath been. I read with ſome pleaſure, that Dr. *Petty* and yourſelf have lately been making fine diſcoveries in anatomy. The ingenious doctor told me, divers months ago, of certain muſical and dialling anatomies, invented by him. But becauſe I have heard nothing more of them, a farther diſcovery from your hand will always be very welcome. There are other fine diſcoveries made by the Bohemian baron *Miſneck*, lately ſent to this commonwealth from the duke of *Courland*, whereby both watches and dials will ſuffer much, if he can make good his invention. The diſcoveries are as yet made only to a few of his moſt confiding friends. Only I have learnt in the general, that he can make a moſt exact and perfect dialling uſe, as I may ſo call it, from the knowledge of the circulation of blood in a man's body, if I have been rightly informed. If I could have gotten a copy of two pretty large volumes, lately brought over by a gentleman of ſingular quality, and who lodgeth in the beſt room of my houſe (for ſo much my chemical ſon doth love and honour him) at this preſent; I would have ſent it into *Ireland*, to put it to a trial, whether you could find any more of theſe fine diſcoveries, which you promiſe to impart at more leiſure. The titles of them are theſe. *Thomæ Bartholini Vaſa Lymphatica nuper Hafniæ in Animantibus inventa. Et Hepatis Exequiæ*, 1653. 2. *Ejuſdem Dubia Anatomica de Lacteis Thoracicis. Et, an Hepatis Funus immutet Medendi Methodum*, 1653. 3. *Ejuſdem hiſtoriarum anatomicarum centuria* I. & II. 1654.

FROM *Upſal* in *Sweden* was likewiſe ſent unto me ſomewhat, which I have not imparted to you, for ought I can remember: it is called, *Nova Exercitatis Anatomica. Exhibens Ductus Hepaticos aquoſos. Et Vaſa Glandularum ſeroſa. Nunc primum inventa aereiſque figuris delineata. Ab Olao Rudbeck Sweco, Cui acceſſere aliæ ejuſdem Obſervationes Anatomicæ.* Thus you ſee what the Daniſh and Swediſh world is attempting and tranſacting in theſe affairs of learning. I wiſh, that Dr. *Petty* would ſhew himſelf to the world by ſome rare piece or other. For ſince the non-performance or non-divulging of the invention of his double writing, his credit is mightily impaired in *England*, and other nations, which have heard of it. Thoſe, that know the way, which Mr. *Wren* doth uſe, ſay, his art of double writing is not worth a ruſh; for it can never be readily practiſed. Honeſt Mr. *Dymock* is blamed almoſt by every body, though the fault, in my judgment, be as much, if not more, in them, that blame him. The earl of *Worceſter* is buying *Vaux-hall* from Mr. *Trenchard*, to beſtow the uſe of that houſe upon *Gaſpar Calehof* and his ſon, as long as they ſhall live; for he intends to make it a college of artiſans; which, if it go forward, I ſhall get Mr. *Dymock* into it, though I had rather he ſhould ſuperintend a college of huſbandmen, whenſoever it can be founded. Yeſterday I was invited by the famous *Thomas Buſhel* (for I ſuppoſe you have ſeen his *Mineral Overtures* in print) to *Lambeth-Marſh*, to ſee part of that foundation or building, which is deſigned for the execution of my lord *Verulam*'s *New-Atlantis*. I make no queſtion, your deareſt ſiſter hath written to you of Mr. *Dury*'s going into *Germany* with Mr. *Pell*. Since his departure, I have printed a treatiſe of his, concerning a body of practical divinity, to be compiled out of Engliſh authors, which is very worth your reading, and therefore ſhall ſend you ſome copies of it. *The Political Viſion* be pleaſed to tender, with my humble ſervice, to your noble brother, the earl of *Corke*. Thus, begging your pardon, for giving you ſo tedious a trouble, with my large ſcribbling, and preſenting again the humble and faithful ſervices of my wife, ſons, and daughters, I profeſs myſelf unfeignedly,

Dear Sir,

May 8, 1654. your moſt affectionate,
and moſt obliged
humble ſervant,
SAM. HARTLIB.

Dear SIR,

MY laſt was dated the 9th of *May*, which was a very huge, if not voluminous anſwer to your laſt of the 21ſt of *April*, with a ſhort letter alſo from my chemical ſon. Yeſterday I ſent you a packet, wherein were 15 copies more of the interrogatories for *Ireland*, two copies of Mr. *Dury*'s laſt treatiſe concerning a body of practical divinity, and an Helmontian manuſcript, which Mr. *Clodius* had lent to Mr. *Morian*. I cauſed it to be tranſcribed out of the original, which is very faulty in divers places, ſo that ſcarce any ſenſe can be made of them; but I fear

the tranſcript is much more faulty, which I had not time to read over, leſt I ſhould have neglected the preſent opportunity of ſending packets. The title of the foreſaid manuſcript is, *Magna virtus verborum et rerum*, about five ſheets of paper. I ſuppoſe Mr. *Clodius* will be able to ſupply the defects, who was fully reſolved by this very occaſion to have ſent you ſome of his medicaments, but that the beſt of them, which is now preparing, could not be ready. But he hopes it will be done within ſix or eight days, God willing, and then he purpoſeth to ſend it with the firſt, with a proof of his other phyſical preparations, which he counts not ſo extraordinary. In the mean time I cannot but tranſmit this way the high reſpects, which he beareth towards your own perſon: for S^r. *K. D.* of whom I have written ſo largely in my laſt, being yeſterday morning with me at my own houſe, and preſſing moſt earneſtly the accepting of his generous offers towards my ſon (for a plentiful proviſion of himſelf and family for two years, with the furniſhing of a complete laboratory) I would give him no other anſwer, but that I would acquaint Mr. *Clodius* with his reſolves, leaving him to the freedom of his own determination. He hath not yet been with S^r. *K.* but when I related the matter unto him, before I could paſs my opinion upon it, he replied—*Timeo Danaos ſua dona ferentes*—I will determine nothing before Mr. *Boyle* be arrived. For whether his eſtate will ſuffer him to contribute little or much for the carrying on of all our phyſical and chemical affairs and deſigns, he alone is to be entruſted with a full and entire communication of them all and others, as we ſhall adviſe amongſt ourſelves. He ſaid indeed, that S^r. *K.* was as gallant a gentleman as ever he had met withal, but yet he could diſcern rather gallantry than goodneſs in the frame of his ſpirit, and of all his actions, both which he had found ſo eminently and ſuperlatively in your own converſation. For my part, I was more thoroughly gladded (if you dare believe me) with this ſolid judgment and affections of my ſon, than with any treaſure of knowledges and experiments, which he ſeems to poſſeſs or to purſue. After he hath conferred again with S^r. *K.* he will, it may be, teſtify, under his own hands, theſe very reſpects unto yourſelf. I have found that paſſage concerning the cure of the ſtone, which the gallant knight ſo highly extolled, in *Barcl. Euph.* Satyr. p. 1. of a *Leyden* or *Amſterdam* edition in theſe following words.

—*Statim notiſſimam herbam oculis meis ſubjicit Æſculapius, quæ calculo bellum indixit multo felicius, quam aut veratrum amentiæ, aut vulneribus Aſciros. Hæc lanceatis foliis piloque ita brevi, ut pene curioſos oculos fallat, crenis denique tenuibus, et ſæpe in obtuſam ſpeciem oras ſecantibus, mediocriter aſſurgit. Radix cauliſque lignea ſubtiliora ſuccam in herbam transferunt. Planta ad ingenium terræ nunc cubitalis, plerumque eminentior, inſigne faſtigium floribus ad examen turgentibus cingit; et virgæ aureæ eſt nomen, ſive quoniam aureæ ac pæne divinæ virtutis eſt, ſive quod præſtantis metalli colorem exigui floris venuſtas æmulatur. Cæterum contuſum in renibus calculum in innoxium pulverem ſolvit. Non in latere, non in veſica dolor; adeo ut tam facili remedio pudeat calculum timuiſſe. Et enim in hyemem ſiccatur æſtivis umbris planta, et ubi gravitas lateris coeuntem morbum præſagit, aureus pulvis ad drachmam mere delibutus ſumitur, ſive ovo liviſſime cocto permixtus. Sed mihi non erat ad manum tam prætioſus pulvis. Itaque recentem adhuc herbam jubeo Fibullium mandere. Nihil eo die viſum eſt ad morbum feciſſe medicamentum: ſed biduo deinde repetitum, ſupra fidem eſt, quam egregie refellerit acerbiſſimum morbum: ſordidus pulvis abunde veſicam exonerabat, cænoſumque ſaccharum pæne ſanguinis imagine pingebat. Jam ventriculo robur redierat, jam corpori toti vigor, et mihi ad perfectionem artis medicæ ſola deerat laurea et emptitii teſtimonii liber. Hactenus Berclaius.* If Mr. *Clodius*'s laborant come in time, I ſhall endeavour to get this phyſick alſo prepared after his better way. By the laſt poſt I got from a counſellor's hand of the elector of *Brandenburg* theſe lines.

—*Inviſit me heri quidam nuperrimè Ratiſbona profectus, qui ibidem ſingularem junioris Helmontii notitiam habuit. Is probitatem ac beneficentiam ejus inſigniter deprædicabat, eumque apud Cæſarem electorem Moguntiacum, alioſque principes, et in ſublimi gradu conſtitutas perſonas, magna verſari in authoritate, mihi referebat, quamvis ipſis Germanam veritatem rotunde dicere non dubitaret. Aulici vero ſtatus tædium omnino eum jam tum percepiſſe, ſolitariamque vitam agere decreviſſe. Ratiſbonæ commoratum, inſignia ſibi veſtimenta conficienda curaſſe, ut hoc ipſo eo commodior ad magnates ſibi pateret aditus. Cum vero locum mutaret, diſceſſumque pararet diſtributis aliiſque dono datis magnificis ac pretioſis iſtis veſtibus, inveteratam rubri coloris togam pelle ſeu corio ſubductam, propriaque manu ſarcinatam (cum non ſolum ſartoriæ, ſed ut reliquarum ferme artium omnium peritus ſit) induere, iterque ſuum plurimum pedibus perficere. In egenos ac neceſſitate preſſos valde eſſe munificum, ſiquidem Ratiſbonæ aliquem, qui ſolvendo non erat, ne infamiæ notam ſubiret, aliquot centum imperialibus ex diverſorio redemit, neſcientibus cæteris, unde tantæ fuit particeps pecuniæ. Curare hinc inde pauperes ancipiti et acuto morbo laborantes. Artem vero aurificam omnino eum repudiare, ludibrioque habitos chemicos hac de cauſa literis eum inviſentes auriperdas vocare.* The letter is dated the 5th of May, 54. Another counſellor of the ſaid elector, who lodgeth in my houſe (as I intimated in my former) tells me of an antimonium roſatum, which he had ſome years ago to ſmell unto, as far ſurpaſſing roſes and other curious odours. Alſo that he had been very credibly informed of another of his acquaintance in *Germany*, which has had aurum roſatum yielding a far more tranſcendent fragrancy, than that of antimony. If gold could be made thus vegetable, really I ſhould prefer it before the producing of the beſt roſes twice in a year. I fear I ſhall not be able to keep that worthy forenamed gentleman, who for my ſake (for ſo he is pleaſed to phraſe it) is come into *England* for a ſhort time, ſo

long till your happy arrival. But having begun to take the next and beſt courſe, I could have made him acquainted with your deareſt ſiſter, who perhaps will give you ſuch a character of him as he deſerves. He preſents alſo his moſt humble ſervice unto you. There is another, an Engliſhman, that hath been ſpecially recommended unto me by Sir *K. D.* His name is captain *Saunderſon*, who hath been of the king's party, but intends now to ſettle himſelf with his family in *Ireland*, where he hath purchaſed land to the value of 200*l.* a year. I have devoted him likewiſe after a ſpecial manner to your ſervice. For I find him a very pretty gentleman, full of good arts and contrivances, but his main deſign is by a new experiment or ferment to make as much ſaltpetre, as you pleaſe out of ſalt or ſea-water. When my chemical ſon ſpoke with him, he confeſſed, that he had hit right on his ferment, which was his ſecret. I long for more letters from your hands, that they may furniſh me with occaſions of enlarging myſelf, and of gratifying your more particular deſires. Here you have a rude draught of Dr. *Jungius*'s Protonoetical Philoſophy, which as it lyes in a pack bound about with ſuch coarſe expreſſions and terms as he uſeth, makes no great ſhew; but if it were fully opened, a great deal would appear to be rich cloth of Arras. This is the judgment or opinion of your,

Dear Sir,

moſt entirely aſſured

faithful friend to ſerve you,

SAM. HARTLIB.

FROM my houſe (which deſireth to have their moſt humble ſervice preſented unto you) near *Charing-croſs*, May 15, 1654.

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* * * * * But before I ſhut theſe, I purpoſe to ſend to him for his anſwer to your laſt letter, to incloſe it in mine. Mr. *Morian* writes again of *Glauber*, that he hath had a very dangerous fall from a waggon, ſpitting much blood, and if the fever prevail upon him, he fears his life; which I pray God may be yet continued, for giving many good hints, at leaſt to the ſtudiers of nature and arts. For, *Deus varie colit hunc mundi hortum & velut per areolas*, as *Lipſius* ſpeaketh. Laſt Friday, the ſad news was brought to my lord protector, of the death of that truly gracious, learned, and incomparable primate of *Ireland*, of whom, no doubt, you will hear more particulars from others. In my laſt I ſent a wrong letter for Mr. *Auſtin*, *A Monſieur Tugontloben*, which I deſire may be returned; for the gentleman, I hear, is gone to the duke of *Holſtein*, and I am to ſend this letter after him. I ſhall count it true civility in him, if he ſhall acquaint me with the proceedings of *Coen* from thence, according to my inſtructions. For hitherto I have been able to learn nothing, but that that chemical and experimenting man hath ſpent vaſt ſums of monies out of the foreſaid duke's purſe, and that he hath brought nothing yet to perfection. But my ſon is greatly to blame for not writing to him ſo courteouſly as he is bound to do, according to that of the apoſtle's, "in honour preferring one "another, *&c. &c.*" The adjoined is the true letter to Mr. *Auſtin*, as doth appear by the ſuperſcription. Sir *Richard Napier* can bear witneſs, how I waited two ſeveral days to have ſpoken with my lord protector, but could not. That good and induſtrious ſoul will not be perſuaded of our dulneſs and untowardneſs for peopling of *England* with fruit-trees. Be pleaſed to let him know ſo much, and that Mr. *Batchelor* of *Eaton*, and Mr. *Langley* of *Pauls*, have promiſed to ſecond our applications with all their might and intereſts. When you are returned, God willing, you muſt needs make a viſit alſo into *Kent*, to colonel *Blunt*'s ſeveral plantations, which will as much delight your obſervations. For I dare believe the well-grounded relations, that have been made unto me, from time to time, of all his choice oeconomical and georgical induſtries. If we cannot help Dr. *Horne* with that true and excellent ſpirit of vitriol, for the preſent, yet I believe a good account of Sir *K. Digby*'s MS. at *Oxford* will be obliging in the mean while. There is lately a very accurate and full catalogue made of all the MSS. in the ſeveral colleges of *Cambridge*, which I wiſh might be communicated in print; for I ſuppoſe there may be ſome chemical, phyſical, medicinal, and mechanical amongſt them. I am writing to Mr. *Brereton*, for the birch-water; for I remember he told us laſt year, that he could procure a great quantity of it out of *Cheſhire*. In my great paroxyſm I uſed it very much, but found no benefit by it. Mr. *Schlezer* preſents again his moſt humble ſervice to you. He bids me to tell you, that he hath an excellent nephretical ſtone, which ſhall be at your devotion, when you pleaſe to call for it. I thought to have mentioned ſomething concerning a very conſiderable huſbandry, laſt week imparted unto me, but I dare not weary your eyes or ears too long; ſubſcribing myſelf ever,

SIR,

your entirely faithful

Charing-Croſs, March 25, 56. and moſt ready friend,

to ſerve you,

S. HARTLIB.

Honoured SIR,

YESTERDAY I received your laſt, ſignifying your return to *Oxford*. I pray God, that your health may be continued and encreaſed, that it may be inſtrumental for the good and refreſhment of many. I am ſtill extremely full of pains, and have much ado either to write or to do any thing elſe. But if the Lord would diſcover the like powerful

remedy againſt the inward piles, as he has done againſt the ſtone in the kidneys by a new medicine of my ſon *Clod* (which he is reſolved not eaſily to impart, and always to diſguiſe under ſome other name,) I ſuppoſe I ſhould draw near to a perfect cure. Above all recipes and medicines Dr. *Gliſſon* has commended to my ſon that of the lieutenant of the *Tower* againſt the piles. I expect my ſon every day, and if the aforeſaid doctor has had any of thoſe ſuppoſitories in readineſs, I hope he will bring ſome of them along with him. In the time I need not tell you, that the moſt learned famous Engliſh Æſculapius (I mean Dr. *Harvey*) is departed this world. I expect your cenſures, obſervations, and communications, upon my former letters. Here you have a vindication of the decaying clover-graſs, written and ſent unto me by Mr. *Wood* from *Dublin*. If you could furniſh me, I would ſay it were very fit, that ſome directions were publiſhed concerning clover-graſs, as proper to take off the prejudice that is of late againſt it, and to inform punctually, in what ſoil it is an improvement, and in what manner it is to be uſed.

As firſt, It may be laid down at a certainty, how deep the root deſcendeth; where it proves beſt, and where it is indifferent, and where it faileth to be an improvement, for want of due depth.

SECONDLY, How it proves in a ſtiff clay land, or wheat land; how in a hot ſandy rye land; how in a very ſtony land; and how in a chalky land, *&c.* and in which kind of ſoil it laſteth longeſt.

THIRDLY, It may be laid down, what beſt uſe may be made of the ground, when the clover decays.

FOURTHLY, It ſhould be carefully advertiſed, how it is to be uſed; for ſometimes it hath been ſeen good, and yet come to nothing, by many kinds of miſcarriages.

IF the cattle bite it the firſt year, ſome therefore will deſtroy, and ſome they will pull up by the root; and ſometimes, the ſecond year, it will be rooted up, eſpecially after moiſt weather, and after a long drought; if it be bitten, it will die; and if it be mowed in unſettled weather, it will ſoon be tainted; if it be ſuffered to be too far ſeeded, before it be mowed, it will be like hard ſticks, too coarſe for moſt kind of cattle. We want clear directions, how we may follow the cuſtom of *Flanders*, to decline all theſe inconveniencies. I long to ſee what has occurred to you in your journey. To me, of late, out of *France*, have occurred theſe following lines.

" In paſſing by *Tours*, and hearing there " of certain ſtrange engines, by which they " water the tabbies and mohairs, we went to " ſee them, and found it an excellent inven- " tion, brought out of *Italy*, from *Luca*, by " the father of him, that hath at preſent the " chief workmanſhip thereof, named, mon- " ſieur *Chauma*. I wonder the engine is no " more taken notice of, nor the uſe thereof " brought into *England*; which certainly " might eaſily be done, by ſuch as are ſkilled " in mechanicks." Thus far a travelling friend. I ſhall tell this Dr. *Kuffler* (whom I have not ſeen theſe fourteen days) of your intimations to tell ſtrange ſtories of the benefit to be made by the watering of land. I ſuppoſe you remember the great expectations I have of the Quaker of *Durham*, *Anthony Pierſon*, his promiſes of huſbandry. I have not yet obtained any thing from his hands; but major general *Lilburne* pretends to know his Univerſal Compoſt; and a friend of his was pleaſed to entruſt me with it, in theſe words. " Plough up your barren ground, " and croſs-plough it, as they uſe to do thoſe " lands, which they burn for bate or betting. " Then gather the turfs, and lay the firſt " courſe of turfs (*e. g.* of two yards ſquare, " the graſſy or heathy ſide upwards) and " ſprinkle upon it a ſmall quantity of un- " ſlacked lime. Then lay the ſecond courſe " (leſs than the firſt) with the green ſide down- " wards, upon the lime; and ſo build up " your heap. Let it lye half a year thus. " If you will ſow winter corn (as wheat or " rye) upon it, let it lye from ſpring to ſeed- " time. If you ſow barley, *&c.* let it lye " from autumn to ſeed-time. The beſt time " to turn it up is, when it is moſt moiſt; " for that will make the lime run and burn " the better. A greater quantity of lime, or " laid in any other manner on the land, burns " out the vegetable ſalt, and ſpoils it, as is " experienced in the Weſt by colonel *Monck*. " When it hath lain half a year thus, it will " be ſo mellow, that it will run like aſhes. " Then ſpread, harrow, and ſow it. If it " want depth of earth, upon the harrowing, " to cover the ſeed, plough it again." Thus I have diſcovered unto you, that magnet of huſbandry, without any reſerves; for I am very ambitious to ſhew myſelf, upon all occaſions,

Honoured Sir,

Charing-Croſs, June 30, 1657. your moſt humble and ever faithful ſervant,

S. HARTLIB.

Aug. 4, 57.

Honoured SIR,

LAST Tueſday, July 29, I wrote largely, encloſing a great packet from *Ireland*, and ſomething of weather-glaſſes, which I thought would have been very welcome unto you; but I have not had one line from you, whether they have been ſafely delivered or not. The encloſed I got yeſterday by the poſt from *Ireland*, with a letter from Mr. *Worſley*, dated at *Holy-head*, July 29. He preſents his moſt humble ſervice. I am told again —As oft as you commend heath, you may do well to put them in mind of adding ſome cordial plant, as ſage, or balm, which will add ſome help, to keep the drink the longer. And you may put them in mind of Roman wormwood, which agrees with all the months that

that have *R*, as for oiſters. We (in *Hereford-ſhire*) begin to plant it, a little of it does much towards the preſervation of the beer. But that heath begets madneſs, is againſt our long and conſtant experience; and how can it be ſo, it being apparently a releaſe to a hard ſpleen, as perfectly as tamariſk? But I inſiſt upon the neceſſity of adding ſome other cordial herbs, to prevent the drink from ſourneſs. In *Herefordſhire*, as a powerful preſerver, they bake wormwood in a loaf of coarſe bread, and break this bread very ſmall into the ale or beer. They ſay it does much pleaſe the taſte, and preſerve the drink. You may ſmile at it, but my witty neighbour, to encreaſe the ſtore of his Roman wormwood, pleached it down in the way of propagation, and it ſucceeded in great plenty. I reſt ever,

Honoured Sir,

your moſt faithful

and aſſured ſervant,

S. HARTLIB.

Honoured SIR,

ON Monday I received your laſt, of Aug. 29, but could not anſwer the ſame, (by reaſon of divers commiſſions and letters, which my lady had laid upon me) on Tueſday next, but ſent only under a covert one from Mrs. *Drury*, and another from Mr. *Worſley*, which alſo by the laſt poſt I received from *Ireland*. It ſeems, that the 26th of Aug. (which is the date of his letter) he did not yet know of the council's order, which my ſon hath ſent unto him. For, beſides that to yourſelf, he ſends another to my lord deputy, and is very earneſt, that it may be ſeconded. But, on Tueſday laſt, I told my lady, that the buſineſs was not only fully paſt the approbation of the council, but likewiſe his highneſs's conſent; ſo that what remains muſt now be diſpatched in *Ireland*. My ſon believes, that the foreſaid order will give Mr. *Worſley* ample ſatisfaction. I am more troubled at your weakneſs and diſtempers, than at my own pains, which rather, God be thanked, diminiſh, than encreaſe. The ulcerous matter is likewiſe no more ſo diſcernible, as it was for divers weeks before; but every day almoſt there comes away little pieces of ſtones, whereby my ſon *Clodius* concludes, that the ſtone is diſſolving. Mr. *Van Muſſig* ſhewed me his doctoral charter; but alas! this will cure no diſtempers nor diſeaſes. Within two or three weeks he is going for *Ireland*, preſenting his humble ſervice. As for the elixir proprietatis, he is very poſitive and peremptory, that there is no better comforting cordial in the world, for weak ſpirited, or aged people. Truly I have found it ſo hitherto, without any inconveniency at all. The publick adviſer of this work gives this following advertiſement. "Next unto "*Vaux-hall*, in *Lambeth*, liveth one *Thomas* "*Smart*, an artiſt, who, conſidering the ne- "ceſſity of the times, and alſo being moved "thereunto by divers pious and godly mini- "ſters, for the welfare of this nation, doth "hereby ſignify, that he hath one medicine, "which, by God's bleſſing, perfectly cures all "gripings of the bowels, looſeneſſes, bloody "fluxes, and their kinds. Alſo another me- "dicine, that is a ſpeedy and perfect cure for "epidemical, feveriſh, and aguiſh diſeaſes, "that now ſo much annoy. The medicines "are ſafe, not unpleaſant to take, and for one "half crown, as much as will be ſufficient for "one perſon. *Probatum eſt.*" Thus far the adviſer. Do you believe theſe medicines? Some weeks ago, Dr. *Broome* told me himſelf, what a wonderful cure he hath performed on Sir *James* (as I take it) *Cunningham*; but, poor gentleman, is brought over-againſt my houſe, where he is to be cut of the ſtone, within a day or two. Dr. *Walter*, at *Hamburg*, writes very ſubſtantial and experimental letters to my ſon. I adviſe him to entertain carefully a ſtrict and faithful correſpondence with ſo able and ſucceſsful a phyſician. I had a curſory reading of one of his letters, wherein he commends hugely eſſentium cervinum. Yeſterday I had from *Tunbridge* theſe following lines.

"It hath pleaſed God to viſit me with a "long and laſting ague, which gives little "intermiſſion for ſtudy. I have had a relapſe "or two, and, after them, ſuch immoderate "ſweats, at night, as have conſumed me to "ſkin and bones. For the ſweats, the phy- "ſician and I am not pleaſed; only the laſt "week, by God's good providence, a gentle- "woman, who came to viſit me, aſſured me, "upon her own knowledge, that two perſons, "viſited with this late ſickneſs, and by ſweats "likewiſe brought into a conſumption, "have, within a fortnight, or little more "time, recovered, and are now alſo grown "fatter and healthier than formerly, by the "only uſe of the Turkiſh drink coffee. The "one of theſe perſons thus cured was a young "gentlewoman, and the other an ancient "gentleman; and of the truth of this I doubt "nothing, the authors being all perſons of "quality and credit. Upon this, I was ear- "neſtly preſſed to ſend for a bottle; and ſo "I had one laſt week; and though I have "taken it but three mornings, yet I find my "ſtomach more clean, and ſtronger to digeſt, "my brain clearer, and my ſweats ſomewhat "abated. And I am the rather convinced "of the efficacy of it, becauſe, as my lord "*Verulam* commends it, it is the Turks wine; "and they, as I underſtand, are generally heal- "thy, ſtrong, fat, and big men. And as "their chief feeding is rice (which alſo I find "a great nouriſher, and amongſt the variety "of meats provided for me, I am weary of "them all but this) ſo their chief drink is "coffee, at which they tipple, with a fool "to make them ſport. Now, Sir, the intent "of this relation is not to inform you, either "of the drink, or berry it is made of (of "which I have taſted, and find the drink to "have its only taſte without other ingredient) "or the virtues of it; to all which I be-

"lieve

" lieve you are no ſtranger; but only give " you in this teſtimony, that you may ſpread " its benefit towards this new diſeaſe, which " I hear is with you; and not only in theſe " parts, but elſewhere, in *Oxfordſhire*, *Norfolk*, " in *Hampſhire*, *&c.* whereſoever an epide- " mical diſeaſe uſeth to rage in the inlands " and ſea-coaſts by us, *Rocheſter*, *Dover*, *Rye*, " *&c.* Another purpoſe of this paper is, to " beg of you ſome of the freſheſt berries, " which may be had of ſome Turkiſh mer- " chant, with his directions to make it drink; " which, if it may be had, I know you may " command; and this for my own recovery. " I have ſent now for another bottle, and it " will laſt me a week more; but, to ſave this " trouble, I beg yours, and hope they will " ſpare of their ſtore, and diſcover the uſe " of it to one, who intends no gain by it. " Sir, now I am upon this ſeeking for cor- " dials (which daily I take, to ſupport my " ſpirits in this weakneſs) I find in the Ara- " bian cordials in our *Pharmacopœia*, in An- " dromachus or Venice Treacle, a great quan- " tity of raw ſilk; ſome of which I deſire " of you likewiſe, if you can direct me with- " al, whether it hath any correctives, or " may be taken alone, as I find it preſcribed " by *Culpepper*. I ſhall once more trouble " you for eggs of the worm. For here we " have trees, and I intend to plant more. " But of this not at preſent." Thus far a publick-hearted learned friend. Sir, do you know whither to addreſs me for the B* berries? I have written to know what will pleaſe the ſecret-monger. Mr. *Wood* tells me of a rare one for a new kind of graffing of vines, which he hopes to attain, and to communicate to me. If you have peruſed my diſcourſe concerning *Ireland*, I deſire ſtill your impartial opinion about it. Since my laſt I have not ſeen Dr. *Kuffler*; but when I do, I ſhall acquaint him with what you have written, being upon this, or any other occaſions,

Honoured Sir,

your moſt aſſured

faithful ſervant,

S. HARTLIB.

JUST now Mr. *Dalgarno* is come to my houſe.

Sept. 8. 57.

Honoured SIR,

NOT only Mr. *Dalgarno*, Mr. *Morſtein*, Sir *Charles Culpepper*, but alſo another Polonian gentleman have kept me ſo long, that I cannot enlarge, having ſeveral things, which muſt alſo, by this very poſt, be imparted to *Ireland*. The one of the encloſed I received by the laſt poſt from thence, and the other from *Saumur*. Dr. *Van Muſſig* purpoſes to go to *Oxford* on Thurſday next. He triumphs to have lighted upon a ſpecial ſecret, or medicine (*multorum morborum curativum*) at *Amſterdam*. But I durſt not aſk the receipt of it, he prizing the ſame at ſo high a rate; or, it may be, he ſuſpects me, as if I would communicate the ſame into your boſom, and therefore reſolves rather to gratify you with it by his own hands; at which kind of charity, or ambition, I ſhall never be offended. If he make no offer, I pray uſe freedom to ſignify to him, that I have intimated ſomething unto you, concerning a ſpecial medicine, which he rejoices to have found at *Amſterdam*. I received a letter for Mr. *Oldenburg*, which ſhall be ſent by the next poſt, with all care and faithfulneſs. Mr. *Oldenburg* complains, that, beſides the two great packets, he has received no more letters. But he may thank himſelf for it, having ſent the addreſs for them but a few weeks ago. I am ſure there is no want on my part. Your laſt is dated Sept. 5. I am ſurpriſed with a kind of aſtoniſhment, that Mr. *Worſley* hath not anſwered my ſon's nor my own letters, which he might have done fourteen days ago. For I have anſwer upon my other letters from thence, which were ſent at the ſame time. By this very poſt I have written again, and my ſon promiſes to do the like, with ſending another copy of the order, with its amendments, and a report, that it is paſſed both his highneſs's and the council's conſent. If he had ſignified his ſatisfaction (for the order is fully granted and drawn up, according to all the inſtructions, which he left behind) the foreſaid order might have been ſent by this poſt to the council in *Ireland*. My ſon is now more and more contriving, how, with the beſt grace and advantage, it may be tranſmitted. For, as ſoon as he ſhall have underſtood his approbation, he intends, that the order, with the addition of ſome affectionate clauſes, ſhall be turned into a letter, written by the council here to the council in *Ireland*, under the council's own ſeal, that it may be diſtinguiſhed from the ordinary paſſing or imparting of orders from hence to *Ireland*, that it may appear a buſineſs of extraordinary import and concernment. The next poſt I hope will bring Mr. *Worſley*'s reſolves. I have alſo preſſed much upon him the performance of his other promiſe, concerning cellars and vinifications of liquors. Mr. *Brereton* propoſes thus. " I like well Mr. *Beale*'s addition of " heath, and I have not yet received the pro- " miſed account of it from the phyſician I " wrote to you of. Your friend there ſpeaks " of recovering ſour or dead beer by fermen- " tation, and that hops doth well to keep " beer long together. I am of opinion, that " if it be very well fermented and purified " at firſt, it will keep of itſelf, provided you " exclude air. And that it is really ſo, is ſeen " in the Scottiſh ale, whereof I gave you the " proceſs, which you have inſerted in your " laſt edition of your *Legacy*, page 231. " Now, to prevent that waſting, which is " there ſpoken of, I think it would be good " to put ſo much oil at the top of the veſſel, " as would cover the whole ſurface of the " drink, at the largeſt part of the veſſel; " by

" by which means, the oil ſtill lying on the " top of the drink would infallibly keep in " the ſpirits, as is known to divers merchants, " vintners, and gentlemen about *London:* for " ſo they keep in bottles, that hold about " two quarts, their rich *Italian* wines, which " will not by themſelves endure the ſea; and " I have drank of them at *London* in April, " ſo that they were above half a year old, " and very pleaſant, full of ſpirit, and no " taſte of the oil at all. But becauſe oil of " olives would be too dear, let it be conſi- " dered, whether rape oil may not be ſo cla- " rified, as to ſerve the turn. For I remem- " ber, that in *Holland* they uſe to fry their " fiſh in it; which ſurely they would not do, " if it gave any ill ſavour: and if it do not, " I do not ſee, why the ſame oil may not " ſerve again and again. For all this while " I ſuppoſe, that the drink ſo kept muſt be " firſt exceedingly well fermented, clarified, " and drawn off the lees." Thus far he. I pray give in your obſervations upon this to him, who is really,

Honoured Sir,

your entirely devoted ſervant,

S. HARTLIB.

December 8, 1657.

Honoured SIR,

LAST Thurſday I ſent divers letters, which I then received by the poſt, under my cover. This encloſed I had from *Saumur*. I got alſo a ſhort one from Dr. *Petty*, in theſe words: " The reſentment I " had of the challenge, was not ſuch, as to " need ſo formal and troubleſom an apology. " To ſhew you, that I am not angry, or vin- " dicative upon the gentleman, I will for- " bear noting ſeveral impoſſibilities in his " contrivances of the dials to all the ſenſes. " When I am got clear of Mr. *Worſley*, I " will have ſuch another bout at learning, as " ſhall both ſtrain my abilities, and demon- " ſtrate my willingneſs to advance it. In " which perſuaſion, I deſire you and my " friends to remain; for what I have been " doing here is but to prepare me thereunto. " This is the 12th letter I have written this " night; wherefore excuſe this brevity." Thus far the rich doctor. I have written to Mr. *Worſley*, that he would unriddle his meaning in that one paſſage. I have the dial, with moſt of the ſenſes, in my poſſeſſion, and therefore cannot but ſmile at his threatened impoſſibilities. Mr. *Worſley* is expecting ſtill ſome engagement upon his phyſico-aſtrological letter: but except I have an account from *Oxford*, upon the foreſaid letter, I am forbidden farther communications. Mr. *Mercator* writes ſomething, which I know will not diſpleaſe him: his words are theſe. *Impoſitum eſt mihi judicium Genethliacon ex hora Nativitatis Domini mei junioris proferre, et credo aliquid veri ſubeſſe quoad temperamentum & conſtitutionem humorum; ſed invenio anteceſſores aſtrologos rem pulcherrimam vaniſſimis commentis obſcuraſſe, ideoque difficultate laboro ubique. Nam aſſeverare nihil volo, quod ratione certa ſtabilire nequeam & tuo ſocordiam priorum. Nam omnia hic (ut fere in cæteris artibus) ex fundamentis denuo ſunt extruenda. Ego vero mallem etiam meum in aliis prius captis ponere, quæ interea delitescunt in pulvere. Atque hoc male me habet.* I received a ſpecial commiſſion from Sir *Charles Culpepper*, who, preſenting his humble ſervice, entreated me moſt paſſionately to put you in mind of the promiſe you were pleaſed to make unto him, about the new invented plough of Dr. *Wilkins*. He bids me to aſſure you; that if you can procure one for him, that you will lay a very great obligation upon him. I humbly beg, for my own uſe, the ſpirit of vegetables againſt fevers. Here you have a copy of Dr. *Horne*'s letter, which contains many conſiderable paſſages in it; on which if you would enlarge your's, the exchequer of the commonwealth of learning would be the richer. Divers weeks ago I preſented you with ſome demands of Mr. *Beale*'s concerning inſects, which were principally intended for Dr. *Starkey*. I have obtained an anſwer from ſome other good hand, which I thought fit not only to tender to Mr. *Beale*, but alſo to yourſelf, as you will find by one of the papers here adjoined. I ſhould be glad to ſee, how you entertain either the divinity, or the philoſophy of it. My pains are very tedious unto me, and much work lyes yet upon my hands; but nothing ſhall hinder me from ſubſcribing myſelf,

Honoured Sir,

your ever faithful, and

moſt obliged ſervant,

S. HARTLIB.

SIR, Mr. *Dury* told me this morning, that he believes my lord *Broghill* is landed before this time in *England*.

January 7, 1657-8.

Honoured SIR,

THE poſts not coming regularly, as they were wont to do, I did not get your laſt of January 2, till yeſterday. The foregoing to this, and which I have already anſwered, was dated December 28. I am hugely therefore troubled, that to this hour I have not yet ſeen your large letter, to which you refer yourſelf. The poſtage of letters are already paid by your laſt diſburſements. I am glad, that at *Oxford* they are ſenſible of any reformation in learning. The former king of *Denmark* took the ſame courſe with the lectures of his publick profeſſors, as you write hath been ordered of late at *Oxford*. Laſt week I received a letter from the vice-chancellor of *Cambridge*; who was pleaſed to ſend me alſo the adjoined printed paper.

The

The laſt Iriſh poſt brought a letter from Mr. *Worſley* to my ſon in theſe words. " I take " very kindly your laſt to me, and that " clear aſſurance you have given me of your " mindfulneſs and care in that buſineſs. This " I do aſſure you, that the thing intended is " ſo real, that if the council here do but " pleaſe to give equal countenance to that, " which they have done to others lately in " their private concerns; the propoſition will " be made to (I judge at the leaſt) ten thou- " ſand pound. For I have in my hand al- " ready a conſiderable ſtock aſſigned by the " donors, and a probability of ſecuring near " the whole ſum within leſs than a month's " time, the council giving the donors encou- " ragement to go on. I took the freedom " to write at large to you the laſt week, and " to give you ſeveral arguments for its diſ- " patch. But all theſe now need not at all " to be enforced, the thing being ſo near to " be ſent; one thing only, as you ſee a juſt " occaſion for, I do think not inconvenient " to take notice of, and that is, that Dr. " *Clarges* is actually ſatisfied his ten thou- " ſand pounds, and captain *Arthur* his at ſix " years purchaſe preſent value, being the ut- " moſt favour deſired by the donors. And " I hope our friends on the other ſide will " not be unmindful to ſuggeſt it here, by " way of allowance of the juſtneſs and rea- " ſonableneſs of our propoſal." The letter is dated December 29. I think I told you already, that my ſon hath ſent him copies of all, which was as this week to be tranſmitted in the originals. Since Monday, my ſon hath been ſo buſy, that I have not been able to have a further account of him concerning this affair. Mr. ſecretary continuing ill, and not meddling with buſineſſes, my lord *Fleetwood* had undertaken to get the letter to be ſigned by his highneſs to the council in *Ireland*, which was the only thing remaining to be done. What Mr. *Worſley* writes unto me, you will find in the encloſed paper. He concludes thoſe real paſſages, with a complaint, as followeth. " I have had a great mind to " entertain you with a diſcourſe or two upon " ſome other ſubjects; but providence hath " hitherto juſtled me out of theſe ſedate pur- " poſes, by bringing in, and throwing ſome " other exerciſes upon me; and ſuch at pre- " ſent is his bleſſed will, to which I therefore " deſire willingly to ſubmit." Thus far Mr. *Worſley*. Some days ago, Mr. *Smethwick* told me, that he had gotten at laſt Dr. *Lake*'s new invented water hour-glaſs. He ſaid, that he had tried it already above fourteen days, and found it ſo accurate, that it excels all the watches or clocks whatſoever. In a word, he counted it an exceeding great rarity, the like never hath been yet brought to perfection in that kind. I am acquainted with the doctor himſelf, (a civilian) who is now going for *Ireland*, to exerciſe huſbandry; being entruſted by the lord of *Strafford* with his lands and poſſeſſions there. He told another friend of mine, that he would willingly beſtow one of his clepſydras upon me, but that he counted it no better than a trifle. But for all this, I do not deſpair of getting one of them, either ſooner or later. Mr. *Beale* was the firſt man, that diſcovered *Norden* of *Briſtol* unto me, with his invention of clepſydras; but ſince he hath advertiſed, that it will require ſome time to get one from thence. It may be, Sir, you have a greater intereſt there than any of us. I remember alſo, that in former years, Dr. *Gauden* was very buſy about meaſuring of time this way. I long to hear more particulars of Dr. *Wilkins*'s philoſophical character. Mr. *Comenius* hath ſent lately to Mr. *Dalgarno* his idea of it; but it is ſo ſhort and general, that it is not worth the imparting. Sir *Charles Culpepper*, though he be out of town, yet I know no ploughman can be ſo greedy of his meat, as he is after that invention. He begged not ſo much a ſcheme, as a mechanical model of it, or the thing itſelf, promiſing moſt willingly to pay for it. You ſpeak ſtill of the German vacuum, as of no ordinary beauty; but the poet ſays, *Uritque videndo fœmina.* Juſt now I received another from you, dated January 4, referring me again to your large letter; but I having never gotten any ſuch letter, (as I told you alſo in the beginning) my mind is not a little tormented with the miſcarriage, or ſo long a delay of it. Hath it not been left behind at *Oxford?* I cannot remember, that any of mine, or of my friends, have thus been dealt withal by our inland poſts. It muſt certainly be ſome miſtake, or other. The amorous perſon is gone into *Cheſhire*, for two or three weeks: his father ſeems now to be more willing to condeſcend to his deſires. But, I ſay again, I have not received the recipe of the wound-drink. Monſieur *Kratſhmer*'s (that is the German's name, of whom I ſpake in my former) medicine againſt the ſtone is certainly moſt excellent, and abſolutely the beſt, that ever I have uſed. But I have already ſpent all, ſo that a few drops more are only left. He hath revealed the recipe to *Clodius*, and offers to aſſiſt and diſpatch the preparation of it. But, to my very great perplexity, *Clodius* is again in ſuch a labyrinth, that he will be forced to break his ovens, and to remove to another houſe, which alſo is a new kind of undoing of him. I have obliged the gentleman thus far, that if you were in town, I could prevail with him to ſhew you all along the making of that moſt ſingular medicine, which *Clodius* alſo, from the authority of it, muſt confeſs to be truly tranſcendent. However, I do here engage myſelf, that you ſhall be made partaker of the true and full recipe of it in due time. For I have a very great and cordial reſpect to prevent, by the bleſſing of God, thoſe torments in yourſelf, which I have endured theſe many months, for want of ſo powerful and bleſſed a medicine, handed over by an extraordinary providence. My lord *B* * and my lord *Barrimore* are expected in town this day, but I can learn nothing more of my lord *Broghill*. I remain ever,

SIR, your humble ſervant,

S. HARTLIB.

February 2, 1657-8.

Honoured SIR,

THE extremity of the froſty weather doth greatly increaſe my wonted torments. But having ſome little intermiſſions, I cannot beſtow them better for the preſent, than by acknowledging the receipt of your laſt *January* 30, with the encloſed to Dr. Secretary, which I ſhall ſuperſcribe and ſend away by the poſt this night. Mr. *Worſley* ſent me a big packet yeſterday, but when it was opened, there was not a word unto myſelf, but another packet within addreſſed to my ſon *Hartlib*, with whom I have not been able to ſpeak this day. It may be he hath been informed, how near I have been to the land of forgetfulneſs; yet I received another letter from him laſt week, dated *January* 20, wherein he entertains me with a large theological diſcourſe concerning Prophecies, but concludes as followeth. "For that of the "malt-drying here, they do ſteep it about "24 hours, they ſpread it thin in the dry-"ing of it, having upper floors to lay it up-"on, through which the wind freely paſſeth, "if there be any ſtirring. They dry it in-"differently at any ſeaſon, though in the "moſt temperate ſeaſon they can dry moſt "at a time; but they do it well enough all "the winter. The other friend, that is like "to give you a viſit, would think a man "much a fool, that would ſerve any man be-"ſides himſelf, or otherwiſe, than in order "to himſelf, being a wiſdom common to "this world. [And that honeſt man he means "him, to whom your letter is to be ſent] you "have ſo often taken occaſion to mention and "deſire my reſolution of, is doubtleſs ſuch a "wiſe man, and ſo as in that wiſdom all "his whole ſecurity is placed. And to all "ſuch it is as real a goſpel-ſaying, as it is a "law-ſaying, *De non apparentibus, et non ex-"iſtentibus, eadem eſt ratio.* But the apoſtle "tells us a better rule, faith is the evidence "of things not ſeen. Pray preſent my ſer-"vice to Mr. *Boyle*, and tell him, I am truly "his ſervant, yet I have not writ to him, partly "in expectation weekly, that I ſhould re-"ceive thoſe papers from *White-hall*, which "are not yet come; partly by reaſon of a "criſis ſome affairs of mine here are under, "which hath lately engaged, and will for a "while take up more of my time." Thus far he: monſieur *D.* was pleaſed to tell me (but this muſt not be known abroad) that though he be diſpleaſed, yet that he is to enjoy, if not all, yet ſome of the benefits of it, at leaſt two hundred a year. And if this ſhould not be ſo, yet I ſhall never change my judgment to count him far more happy in ſerving that more general ſurvey of all God's glory, and the God of human kind. For this is the honeſty of that buſineſs, which will not be without ſignal providences, and ſpecial acquiſitions and enjoyments better than *Dublin* or *Ireland* can afford. I ſhall not be wanting to obtain that ſecret, which hath been imparted to Mr. *Milton*. It may be the publick gentleman, that ſent it unto him, will let me have a copy, in caſe the other ſhould not come off readily with the communication of it. But if yours would aſk it from Mr. *Milton*, I am confident he would not deny it. My ſon *Clodius* tells me, the German phyſician, of whom I wrote before (*Kratſhmar*) is a rare man for chemiſtry and phyſical knowledge and experience. And though he is not very willing, that I ſhould be admitted to any of his arcana, yet I believe the gentleman himſelf will hardly conceal any thing from the crazy and afflicted creature. Mr. *Morian* did promiſe me not long ago a few doſes of *Glauber*'s univerſal medicine, but that he put too high a price upon it, at leaſt his purſe could reach unto it. I dare not crave it from Mr. *Morian* for a ſecret reaſon. For having ſhot an arrow of charity at random towards *Zurich*, it lighted upon our reſident there Mr. *Pell*, who hearing of his very low condition, and to have been aſſiſted with 3 *l.* ſterling, by Dr. *Van Muſſig*, ordered, that the ſum of 10 *l.* ſterling, ſhould be made over to that worthy man out of the penſion, which the ſtate doth pay him quarterly. But this being ſubject to many delays, Mr. *Haak* undertook in the mean time the paying of him by bill of exchange, which laſt week he acknowledged to have received. Now if I ſhould beg a few doſes of the Glauberian medicine, Mr. *Morian* might happily think, that I deſired to be gratified this way; which truly is far from my ſpirit and intentions. But I am confident, if I ſhould venture ſuch a requeſt upon him, he would certainly pay for the medicine whatever it ſhould coſt, out of thoſe ſupplies, which have been procured, by the bleſſing of God upon my hearty recommendations. Therefore I ſhall a little defer this matter, and wait for ſome other opportunity. As for Dr. *Bonet* I have his expreſs engagement and promiſe, that as ſoon as his *omnium morborum curativum* is brought to perfection (which he hopes will be done within a few weeks,) I ſhall have many doſes of it, which I ſhall inſtantly certify you of as ſoon as I have received them. Any thing, that can be imparted for general good, for keeping of poultry, or the artificial diſcoveries of hatching of chickens, will be very welcome to my hands. Mr. Vice-chancellor of *Cambridge* (Dr. *Worthington*) pleaſes me not a little by writing in his laſt.— "We have divers fellows of colleges, who "have made excellent progreſſes in anatomy "of ſeveral kind of creatures, and have "ſome obſervations peculiar. They have "alſo much travelled in botanicks, and have "got together many hundreds of plants in "ſeveral gardens here. Some, that are rare, "and for which they have been ſent to from "thoſe, that profeſs great knowledge. They "intend to publiſh a Phytologia of ſuch herbs "as are within ten miles of *Cambridge*, which "they have often travelled, and found ſome "not mentioned in other herbals. And for "the names of herbs in the Phytologia Bri-"tannica, and other herbals, they have found "many errors, which have been propagated "from one book to another; and they judge

it

" it a good ſervice to reſtore them to their " own true names." Thus far of experimental learning at *Cambridge*. By the adjoined narrative of the life and death of that late incomparable univerſal ſcholar at *Hamburg*, you will oblige, it may be, divers of the *Oxford* worthies, Dr. *Ward*, Dr. *Wallis*, if not alſo your whole philoſophical club. The other paper is worthy to be taken into their ſerious conſideration. But I beg, that the moſt intimate and friendly paſſages (which are only poured into my boſom) may be concealed. I have received, and almoſt diſtributed your packet with Mr. *Auſtin*'s books, and ſhall ſtudy the like real thankfulneſs. Mr. *Brereton* writes in his laſt, *January* 30.—" If Mr. *Boyle* be " come to *London*, I pray you preſent my " moſt humble ſervice to him, and let him " know, that I hope ſpeedily to have ſome- " thing for him worthy his knowledge, but " as yet I have not; which is the cauſe he " hath not heard from me."—My ſon *Clodius* is removing this very day to another houſe in *Axe-yard*. Mr. *Stroud* is come up to *London*. My lord Protector ſent him a horſe worth 150*l*. My ſon excuſes himſelf, that he cannot come at me. My lord Protector's ſpeech is ſo full of high and particular reflections, that the printing of it is denied, though the parliament has deſired the ſame. A copy of it was ſent by Mr. Secretary to the Swediſh miniſters here. The houſes cannot yet agree, but are in great diſorder. If they continue ſo, it is apprehended they will ſhortly be diſſolved. Juſt now my ſon comes to ſhew me Mr. *Worſley*'s laſt letter, whereof you ſhall find an extract here adjoined. By it you will ſee, more ſeconding letters of recommendation being called upon, how ſeaſonably yours will come to Mr. Secretary. Thus I reſt ever,

Honoured Sir,
your moſt willing faithful ſervant,
S. HARTLIB.

April. 8, 58.

Honoured SIR,

HOPING you are ſafely arrived at *Oxford*, I preſent theſe encloſed, which came yeſterday to my hands, without a word to myſelf. I beſeech you, if there be any better (or worſer) news concerning our common friend, or the honeſt buſineſs, to give me notice of it by the next return of the poſt. It ſeems, you forgot to deliver thoſe papers, or extracts out of authors, concerning an artificial way of hatching of chickens, which you more than once promiſed unto me. Our reſident from *Zurich* writes as followeth. " Here you have what I wrote upon occaſion " of that of Mr. *Beale* from *Hereford*, Jan. 18. " I long to ſee that diſcourſe concerning " Engliſh crabs and wild pears, and the way " of ordering thoſe deſpiſed fruits, that their " juice may be raiſed to excel the wines of " *France*. Some parts of *Helvetia* are full of " vineyards, yielding great ſtore of unpleaſant " white-wine, or claret. In other parts of " the country, the vines are killed by froſts " and nipping blaſts from the ſnowy moun- " tains. There they drink water, or whey, " or milk; which makes them larger limbed " and taller than their neighbours. Many " places are full of wild cherry-trees. One " ſort, which is ſmall, black and ſweet, is " dried and kept in great cheſts, in every " country houſe, for the uſe of the table, all " the year. Some gather more than their fami- " ly can eat in a year, becauſe they can diſtil " a ſtrong aqua-vitæ out of them, which they " ſell in the market towns and cities. In the " landgravate of *Turgow* they make great " ſtore of perry, of a ſort of very ſmall pears, " which, as I have heard, are hard and full " of very unpleaſant juice, ſo that no man " will eat one of them raw. But ſome boil " them, and, with I know not what cookery, " make a diſh, to help furniſh a table. Some " tell me, that the Turgow-perry is of two " ſorts. The one boiled to the height of a " ſyrup, ſo that it becomes almoſt as thick " and as ſweet as honey. The other ſort un- " boiled, and pretty clear. In other places " of *Helvetia*, the boors make drink of the " wildeſt apples, as well as of wild pears, " calling them by the name of muſt; perhaps " becauſe it always keeps a ſweet taſte, ſome- " what like to that of new preſſed wine. But " thoſe boors ſeldom ſell any of this muſt, " keeping it for their own palate, being con- " tent, that the citizens ſhould deſpiſe it, as " drink for clowns; though ſome think, that " now and then it proves better drink, than " can be made of the beſt grapes in that " country. Alſo *Glauber* hath told us, what " winy drink he hath made of hips and haws, " *&c.* But I fear his chemical fermentations, " joined with all the experience of *Helvetia* " and *Normandy*, would not be able to make " drink of crabs and wild pears, that ſhall de- " ſerve to be compared with Rheniſh, Bac- " charac, Canary, or Greek wines; which " your friend ſeems to ſay he can do, and " therefore I deſire to read more of his writ- " ings on that argument." Thus far Mr. *Pell*. I ſent away on Tueſday the letter I received for Mr. *Worſley*, remaining ever,

Honoured Sir,
your moſt humble devoted ſervant
S. HARTLIB.

April. 27, 1658.

Honoured SIR,

I MAY truly ſay, even in an outward ſenſe, " I die daily." Theſe three days, every night I have been near unto death, ſo exceedingly vehement have the pains, eſpecially of the ulcer and piles, encreaſed upon me. For want of Mr. *Kratſhmer*'s medicine, I have been forced to uſe that, which Dr. *Bonet*, out of ſingular love, did ſend my ſon *Clodius*, conceiving it the preparation of the ludus, which

he doth prefer above all other medicines in this kind. It wrought notably upon the ſtone, and brought away divers pieces of it, with abundance of ugly gravel. But my ſon forbad the continuance at laſt, perceiving it to do hurt to the ulcer. Now he hath made Mr. *Kratſhmer*'s medicine (but not yet by his own better preparation) which I am to take to morrow, God willing, as the moſt ſuitable found by experience as yet to all my three moſt tormenting diſeaſes. This night my poor wife roared out as much as I did; but behold, though my pains continue very ſharp, yet I am enabled to preſent my reſpects, in acknowledging the receipt of your laſt, which not before this morning was delivered unto me, being dated April 22. I ſee alſo, the like miſcarriage has befallen the delivery of mine; which is not ſo juſt and fair for them, that have the ordering of this affair, and who have been offered, not long ago, to manage that office, the ſum of ſeven thouſand pounds to them. I believe really, that my lord *Broghill* was very ill when our friends came to wait upon him. Mr. *Kratſhmer* hath been ſince very ſick and forced to keep his bed and chamber. But Mr. *Marvel* did ſend again another expreſs unto him, that his buſineſs was laid ſeriouſly to heart. Mr. *Dury* doth beſtir himſelf daily for him. Yeſterday he went to *Hackney* to ſpeak with Sir *Thomas Winor*, about the contents of his highneſs's letter for advancing of four or five hundred pounds, for the relief of the twenty families. But the poor man excuſed himſelf, that he had no money, and becauſe the other treaſurer was abſent, that ſhould concur with him. The collection is begun to be made in ſeveral churches in *London*; but what farther expedient they will find out for the advance-monies, I cannot tell. I will ſhew Mr. *D.* what you write in your laſt, concerning my lord *Broghill*'s concurrence. I perceive they will engage him to give intelligence of thoſe quarters of *Germany*, where he lives; which will the more oblige them, as I conclude, not to diſmiſs him, without a good viaticum. Mr. *Kratſhmer* hath preſented a printed paper of anagrams (which I was diſſuading him to do) but you cannot believe what acceptance they have found, both with his highneſs, and the whole court. For my part, I care not ſo he be holpen, with anagrams, or without anagrams, and diſpatched to go in the company of the other gentleman you know of. For he begins to be almoſt impatient of the long delays. My ſon *Clodius* is well again, God be thanked. The poſtage of your letters is already paid. My ſon came to me, three days ago, very much rejoicing, for obtaining, very ſtrangely and providentially, a ſecret of a very great importance, and which his deceaſed brother-in-law's ſon hath denied to Dr. *Kuffler* theſe twenty years. When his brother-in-law was a dying, he ſent for Dr. *Kuffler*, with an intention to reveal and confide it into his breaſt; but he was dead before he could come at him. How far my ſon is bound not to reveal it, I cannot ſtate the caſe; but by expreſs covenant he is bound up not to do it to Dr. *Kuffler*, who ſeems to prize it above any other thing he knows; and fancies himſelf to be made for ever, as they call it, if he might but know that very ſecret, which now is fallen, as it were by the bye, into my ſon's hands. All this in very great faithfulneſs to yourſelf alone. In my former, as I remember, I ſpoke ſomething of a ſick-bed. Whatever it may prove, I count it more worthy to be taken notice of, than any French bed of ſtate. The account, which I received ſince of it, runs thus. "If this, that appears "in the model of Mr. *Owefield*'s dwelling, in "the *Strand*, near the *Savoy*, ſick bed ſhall "be found to hold in the great as well; then "I ſay, that I very well like that part, or "joint, that is made to raiſe the head; for it "is done more eaſily and equally, than can "be done by hand, and that without diſturbance to the ſick, without waking him, if "aſleep, without ſtraining him (if extreme "weak, ſore, or wounded) to riſe and ſit up, "as the manner is, whilſt they raiſe and alter "his pillows; by which means alſo, many "times, the ſick, being in a ſweat, takes much "cold, which is this way prevented. The "like device ſerves for the like purpoſes, ſo "far as is neceſſary, at the bed's feet.

"As for that contrivance at the ſide, to "raiſe or let fall either ſide, I do not perceive "ſo much uſe thereof: for no well man can "endure to lye on the ſide of a hill, in a "poſture always ready to tumble down. And "if it be intended only to help him to turn, "it will badly do that, without two or three "more to help, and then the uſe (viz. the "ſaving that charge) is loſt. And, without "ſome care, one alone, ſtanding on one ſide "the bed, and turning the ſame ſide up, may "poſſibly throw the ſick perſon out of the "bed, or againſt the bed's-poſt, to his terror "or hurt. But this can do no hurt, if let "alone. In the whole matter, I find conſi-"derable eaſe and advantage to the ſick, "and charge ſaved, one perſon being, by "this means (ordinarily) enough to look to "one, though very weak." Thus far one of my learned ſurveyors. What the inventor will be able to alledge, in vindication of all the parts, I ſhall learn very ſhortly, I do not remember, whether I have told you ought of a weatherwiſe toad, diſcovered unto me from *Zurich*, March 21, 58, in theſe words. "It was obſerved in the court, that *A. M.* "(which, I hear, was *Adrian May*) was wont to "foretel the change of weather confidently "and infallibly; wherefore the king would "needs know of him, what it was that en-"abled him to out-do all other mens con-"jectures in that ſort of predictions only. He "replied, that he had a familiar, which he "durſt not ſhew to others, for fear they "ſhould ſay it was a devil; but he knew his "majeſty would not miſtake ſo groſly, nor "diſcover the myſtery to others, that were "not worthy to know it. Hereupon he led "the king into an odd corner of the garden, "where, in a blind place, he had ſo ſhut up a

"great

" great toad, that ſhe could not get out. Hi-
" ther, ſaid he, do I come two or three times
" every day, to ſee how her colours change,
" having long obſerved great variety in them,
" according to the different alterations of the
" weather at hand, *&c.* And theſe are the
" only aſpects, that I conſider for my prog-
" noſticks of the weather." Thus far of this pretty natural weather-glaſs. But I have written back to our learned reſident, there, to reſolve me, if he can, theſe farther queries; for his relation ſeems to me ſomewhat ſhort, and would be more largely explained; as 1. What thoſe colours and varieties of appearances were. 2. What alterations they did portend; whether rain, ſtorms of wind, change of heat and cold: all theſe, or only ſome one of them. 3. How the toad was maintained, fed, or kept alive in that cell. By ſome of the adjoined papers you will ſee what my Hereford philoſopher hath returned to theſe and ſome other particulars, worth your knowledge and improvement. In the extract of Mr. *Worſley*'s letter, imparted in my laſt, he ſaith, " The council retracted their former
" order, and made me another, in all things
" ſuitable to what they had promiſed, and
" made me expect." (The following words, which ſhould have been added, were left out.)
" A copy of which I ſent to Mr. *Boyle* that
" week." This copy I beg from your kindneſs; for I ſuppoſe he hath ſignified this on purpoſe, not mentioning any thing of his private condition, that I ſhould receive information and ſatisfaction from that order. And having reſolved, for time to come, to look upon me no more as a private friend, but as a father, it is fit I ſhould be acquainted with whatever hath, or ſhall befal this my ſon. In that letter, of the 14th of April (which is the laſt I had from him) there are ſome other lines alſo, which deſerve to be communicated, and which then I could not tranſcribe. For he writes moreover, " For honeſt affectionate
" Mr. *Potter*, I have returned an anſwer to
" his letter, which I think will very well ſa-
" tisfy [I conjecture about the ſkin before
" the bear or P. M. be had.] That well
" mentioned in *Herefordſhire* to yield bones
" deſerves to be more accurately ſearched,
" and to try, whether thoſe bones have not
" ſome ſingular faculty in broken bones like
" to the lapis oſtocolla of *Germany*. About
" the preſagous nature of ſtones, I cannot ſay
" any thing rare or very ſingular hath fallen
" within my obſervation at any time, and
" therefore I would be the more glad to hear
" any thing of it from our friends. For
" weather-glaſſes, to ſhew you, that I have
" not been wholly idle, nor, that I did ſet
" another a taſk, harder than I would follow
" myſelf; before I came over, I had ſeveral
" made for me, and ſeveral ways tried for the
" making both of their heads and cylinders
" exact and even. And I muſt, by the way,
" tell you, no man muſt expect another will
" ever be accurate in mechanical matters, up-
" on a bare direction, without we take pains,
" ſtand by, put to our hands, and help to
" contrive ourſelves. This I did, and had at
" length ſuch neat glaſſes made, as did very
" much pleaſe me; the cylinders being very
" even, and of a convenient proportion, both
" in their lengths and diameters, to their
" heads. Being come over hither, I had one
" exactly graduated into five hundred parts,
" and the length and heat were ſo proportion-
" ed, that in extremity of cold this winter,
" the water did riſe to 180. I have made
" many obſervations, which do confirm my
" former conceptions; *viz.* that, to be in-
" deed exact, doth require ſeveral glaſſes to
" be ſet in ſeveral places, and ſo conſtant-
" ly obſerved together. You will much oblige
" me, by letting me ſee our friend's diſcourſe
" of wines, with the whole contrivances of
" them; which I beg with the very firſt."
Thus far my philoſophical ſon. And having written thus far, my ſon *Hartlib* ſends me your laſt to me, dated April 24; which the blind poſt brought to his houſe, miſtaking *Axe-yard* for *Charing-croſs*. The letter to Mr. *Worſley* ſhall be ſent this night, encloſed in mine, who have written very largely to him. I wonder I do not hear yet of the arrival of Mr. *Wood* to *Dublin*. My ſon *Clodius* was juſt with me, bringing me ſomething of Mr. *Kratſhmer*'s phyſick, which he hath prepared, but the pipe burſting, he could ſave but a very little, promiſing to make a great quantity, as ſoon as the other pipes come from *Lambeth*, which are promiſed next week. He is pretty well again, God be thanked, and ſent you another packet on Saturdy laſt, of which I can bear witneſs. Mr. *Brereton*'s father will have him to come down again; but he is now fully reſolved to marry before he go down. If he knew of my writing to you, he would certainly preſent you his unfeigned ſervice. How much Mr. *Beale* is your trueſt ſervant, you will ſee again in the adjoined papers. There is not the like man in the whole iſland, nor in the continent beyond the ſeas, ſo far as I know it; I mean, that could be made more univerſally uſe of, to do good to all, as I in ſome meaſure know, and could direct. That glaſs, with whatever was in it, I did deliver very carefully to Mrs. *Dury*, according to my lady's direction. But Mrs. *D.* I remember told me at that time, that ſhe was half reſolved to come over. But hearing afterwards, that ſhe could not come, ſhe ſent both it and many other packets of mine and others into *Ireland*; although I cannot hear to this day, that any of them is arrived. I ſent likewiſe a large writing of Mr. *Beale*'s upon *Caſaubon*, which my lady does very much deſire to ſee, to Mr. *Worſley*, by him to be conveyed to her. But Mr. *Worſley* ſays, in his laſt, of the firſt of April, ' For thoſe
' papers and books you mention to have for-
' merly ſent by Mrs *Dury*'s conveyance, and
' thoſe animadverſions of our worthy friend
' on *Caſaubon*'s Enthuſiaſm, I have not as yet
' received any of them." But O! what a ſad and ugly note do I receive from *Zurich*, in theſe expreſſions! " This week I heard,
" that your count of *Hohenloe* is certainly
" married,

" married, and goes ordinarily to maſs with " his counteſs, profeſſing himſelf an unfeigned " papiſt." He, that told me this, was the count's great friend heretofore. He ſays, the young couple will ſpend his nothing and her portion in three years, and then they may go a begging together. Some ſay, that he, by falling from Calviniſm for a popiſh wife, hath but followed the ſteps of his father, who turned from Lutheraniſm for a Calviniſh wife; and thereby came to be hated by all his kindred, who were all Lutherans, and ſo continue. I doubt his ghoſtly father will tell him, that he is not now bound in conſcience to pay his heretical creditors. Thus far our reſident, April the 11th. Though I be like to loſe thirty pounds ſterling of my own, ſtanding engaged to others for fifty pounds more, yet this doth not ſo much affect; but the other part of the information is really ſuch, as doth fill continually my heart with ſpiritual horrors and ſorrows, that it is ready to burſt into tears (yea of blood, if it be poſſible) when I have occaſion either to write or to ſpeak of it. I beſeech you to oblige monſieur *du Moulin* to gratify my lady's and mine own deſires, according to one of the papers here encloſed. Concerning the ſtory of my lord *Middleſex*, my worthy correſpondent anſwers thus: " I " have requeſted my nephew to enquire of " Sir *W. Pye*, the truth of the famed ſtory. " He is a near neighbour, kinſman, and very " much reſpected by Sir *Walter*. But by the " like thing, which I heard from colonel " *Harley*, as related by the ſaid lord to colonel " *Harley*'s ſiſter, I ſuſpect it will be but a " drunken ſtory. It is not like to have better " teſtimony, than of drunkards." I have procured a copy of the ſame by lord *. * * for my lady, and am watching every opportunity to ſend them away, with ſome other books, for *Ireland*. The cavaliering party is not only to be ſecured in their perſons and horſes, but ſome of them to be tranſplanted from one county into another. Yeſterday my lord *Skippon* told my ſon *Clodius*, that the lord *Rich*, now earl of *Warwick*, was ſick unto death. There is no more ſpeech of a parliament, but believed there may be one about the beginning of September next. Mr. *Jeſſop* hath been very ſick, but is upon recovering. I cannot more at preſent, but remain ever,

Honoured Sir,

your moſt faithful,

humble ſervant,

SAM. HARTLIB.

May 29, 1658.

Honoured Sir,

ON Tueſday laſt I wrote largely, though under extremity of pains. On Thurſday I ſent a letter from Mr. *Worſley*, with a few words of mine upon the ſuperſcription, and by your ſervant a large packet from my lord *Broghill* yeſterday morning. I had not written at this time, but that I am bound to perform an extraordinary duty towards my worthy correſpondent Mr. *Beale*, he deſiring this very favour from my hands. Your excellent ſiſter did write April 24, as followeth, " By this poſt I receive from my brother " *Broghill* an aſſurance of his being ready to " ſerve your excellent Hereford correſpondent, " and therefore pray put him to the trial, by " offering him ſome opportunity of being ſo " nobly imployed." And in another letter of May 8. " Mr. *Beale*'s promiſe of ſeveral " ſheets of his I look upon as a great one, " and worthy of much more than thanks " from me, who muſt confeſs to read what I " have already ſeen of his with much ſatiſ- " faction." The Lord grant it may be alſo " with much edification; if not, I am ſure " the fault is not in the matter, but in " my heart. My ſervice and acknowledg- " ments to him, I beſeech you. I would fain " know how he is got free of his committee." But by Mr. *Beale*'s extract of a letter of May 21, you will ſee what opportunity he hath diſcovered, that may redound to his advantage. May it therefore pleaſe you, Sir, by the firſt occaſion of writing to preſent this caſe and opportunity to the moſt ſerious conſideration and real aſſiſtance of my lord *Broghill*, according to the adjoined paper. And though he be abſent for the preſent, yet I make no queſtion, that by an affectionate letter he may work powerfully upon my lord *Jones*. Mr. *Beale*'s caſe ſeems ſomewhat like that of *Daniel*'s, when he was caſt, without a cauſe, into the den of lions. But if my lord *Broghill* will but do as *Darius*, there is no doubt but he may be delivered. If you would alſo recommend the ſame perſon and caſe to Dr. *Wilkins*, he might alſo be very inſtrumental to ſecond my lord *Broghill*'s affections to my lord *Jones*, and ſome others. Mr. *Beale* hath written in his laſt very learnedly and largely of colours; which, being but begun to be tranſcribed, my amanuenſis falling ſick this afternoon, I muſt defer the ſending to another poſt. In the mean while, and ever (having been tired by my wonted pains, and large letter to Mr. *Beale* by this very poſt) I reſt,

Honoured Sir,

your moſt obliged,

faithful ſervant,

SAM. HARTLIB.

THE electoral college hath written to the king of *Sweden*, promiſing not to proceed to the imperial election, till the Auſtrians and Poland have firſt made their peace with him. This may reflect alſo not a little upon the affairs of *C. S.* and of *Spain*. There appears as yet no poſſibility of relieving of *Dunkirk*.

Honoured

May 13, 1658.

Honoured SIR,

I HAVE not yet heard whether you received mine of May 4, wherein one was encloſed from the excellent lady. The 8th of May I wrote very largely, adjoining many conſiderable papers. I hope, that both are come ſafe to your hands. Yeſterday I had another letter from Mr. *Worſley*, of the 5th of May, of which you have the principal extract here adjoined. For in a poſtſcript he adds, " I ſhall deſire, if you pleaſe, [but why " ſhould I not pleaſe?] that a copy of this " may be ſent to Mr. *Boyle*, (to whom I can- " not at preſent write) that he may know " how the better to write or ſpeak to the " ſaid Mr. ſecretary about this buſineſs." He introduces the extract thus. " I was, yeſterday " exceedingly refreſhed with our friend Mr. " *Beale*'s papers, containing ſo many things " ſpiritual, and worthy of obſervation, upon " the learned *Caſaubon*'s tract of enthuſiaſm. " Truly, when I read it, I found ſo ſtrong a " leaven in it, that I knew not how to give " over my meditation upon it, till very late " at night, intending, as this day, to write " you a large anſwer, of my thoughts about " it. But being, through a ſudden change " and alteration in the air, taken with a ſud- " den indiſpoſition, I muſt be forced to de- " ſire your excuſe, until the next poſt; at " which time, if the Lord pleaſe to afford " me health, with other opportunities, I " ſhall endeavour to give you ſome reaſona- " ble and full ſatisfaction. And for your " large letter alſo, of the 22d of April, with " the ſeveral ingenious papers encloſed, I " muſt be forced to reſpite my thanks for " them till the next." The letter is dated not at *Dublin*, (for I believe my writers do not love to write hard names) but at *Clantarffe*; which I mention, becauſe I would fain be informed myſelf, for certain reaſons, how far that place is diſtant from *Dublin*. Yeſterday I had alſo a letter from *Youghall*, in theſe words. " Our friend from " *Dublin* writes, that his propoſitions for " learning have lain theſe two months before " the council, but not yet advanced. I now " intend to write to *Broghill*, to quicken my " lord deputy therein. I have received all " your packets, and, in ſome of them, Mr. " *Auſtin* upon my lord *Bacon*'s Natural Hi- " ſtory. I have this week been taught a ve- " ry plain medicine againſt the piles, which " the perſon, that taught it me, recommend- " ed upon her own experience. Take the " white part of the dung of hens, and hogs- " lard, beat them well together, and put " ſome of that upon a warm ſcarlet, very " warm to the place; repeat it, as there is " occaſion. This may eaſily be tried, and " will no leſs be bleſſed, for its cheapneſs " and meanneſs. For the Lord made the " poor as well as the rich, and provides for " the one as well as the other; nay, more " for the poor, becauſe they are more im- " mediately caſt upon him for proviſion, the " rich taking their own proviſion upon " themſelves, and ſeldom looking ſo low as " the common things, which God has filled " with virtue, or ſo high as his bleſſing for " their cure. I juſt now heard, that Mr. " *Wood* is landed, and has brought me your " preſent. The letter is dated April 24. In " the adjoined extract, you will ſee how care- " fully ſhe is proſecuting the obſervations " relating to the deſign for regiſtering of il- " luſtrious providences." Thus far that great and moſt illuſtrious ſoul. I have a number of her other moſt excellent relations on this argument, but I ſpare you. I pray let not my pretty creatures be ſlighted in your Oxonian walks, as here they are repreſented unto you from *Hereford*. I pray you take notice of a certain tract come forth lately under the name of, *Hydriotaphia, Urne-burial; or a diſcourſe of the ſepulchral urns, lately found in* Norfolk: *Together with the garden of* Cyrus: *Or the Quincuncial Lozenge, or Network Plantations of the Ancients, artificially, naturally, myſtically conſidered. With ſundry obſervations. By Thomas Browne, doctor of phyſick.* To be had at the ſign of the gun in *Ivy-lane*. It ſeems to be no ordinary book. The loſs upon *Oſtend* is very conſiderable. Mr. *Cotton*, (ſon to Sir *Thomas Cotton*) who ſtabbed himſelf, is ſince dead of his wounds. Doth not the famous library fall by this means to my lord protector? My lord *Northumberland* preſented his highneſs this week with two moſt gallant and ſtately horſes. But the miniſter of *Petworth*, Dr. *Cheynel*, is not ſhot, as was reported; but too true, that he is fallen quite diſtracted, and (if it be not miſreported) ſent to *Bedlam*. The court of juſtice have met twice in one day, and that is all that they have done as yet. Mr. *Morian* tells me, from *Arnhiem*, that Dr. *K.* was ſhortly to give a proof of his firework to my lord protector. And this morning (for the doctor never or ſeldom comes more at me) Mr. *Brereton* was telling me, that he intended to be at *Woolwich* about five a clock in the afternoon, being the time appointed by his highneſs to ſee the undertaking performed himſelf, being to be there in perſon. The foreſaid good man wiſhes, that he may not blow up a good conſcience to get riches by ſuch means. My ſon *Clodius* wrote, that he would be at home as yeſterday, Mr. *Stroud* continuing very ill; but he is not come this evening for aught I know, your five ordered favours are not yet delivered. You would pardon this piece of imprudency, if you were acquainted with the particulars of my very great ſtraits, to ſay nothing of the continual (almoſt daily) diſburſements for others, and the gratitude and juſtice of account, which is due, upon all ſuch occaſions to me given, from,

Honoured Sir,

your unfeignedly faithful,

and moſt obliged ſervant,

S. HARTLIB.

Honoured SIR, May 25, 1658.

THE lord is ſtill exerciſing your poor ſervant by his various diſpenſations in ſome doubtful way. For the horrid pains of the ulcer being ſo extremely upon me, it put my ſon *Clodius* to a great deal of fear in point of life. But ſince my laſt the fury of my pains are very much, God be thanked, abated, and a great deal of ſtuff with 30 or 40 little ſtones are come away from me, ſo that I cannot tell what the lord means to do with me. For, as I told you once already; as ſometimes he perſuades my heart, that I ſhall not die, but live to declare his works, ſo always he doth temper my will with a great deal of cheerfulneſs to be ſubmiſſive to his pleaſure, whatever it ſhall be, for life or for death. There is a German at *London*, who will not be known by any name, but counted a ſecret (I mean Cainitical) philoſopher, now going for *France*, who is ſaid to have a moſt admirable medicine for curing of ulcers in the bladder, or any other part moſt perfectly. But I am afraid he is over-run with a worſe kind of ulcer than myſelf, being obſtinately reſolved never to impart this ſecret. Whether he can be prevailed withal upon any reaſonable terms to part with the medicine, I cannot yet determine. He letting fall ſome words, that the medicine was made out of minerals, my ſon *Clodius* begins to conceit, that it may perhaps be that very medicine of mercury, which he is now preparing for me. He is aſtoniſhed at the operations of the other medicine in me againſt the ſtone, and confeſſes never to have ſeen the like; conceiting withal, that I may yet be a healthier creature than I have been all the days of my life, when all the tartarious matter ſhall be thus purged out of my body. But theſe are mainly to acknowledge your ſingular condoling affections in your laſt of May 22. *Caneparius*'s book cannot be in a better cuſtody than my own, and I ſhall not fail, God willing, to give notice of it to Mr. *Worſley* himſelf. My ſon *Clodius* is reading of it for the preſent, commending it in many reſpects. The ſame author hath written another book, which is as it were a whole body of philoſophy, as Mr. *Kratſhmar* told me. But if I hear of more, I ſhall give notice of it. Dr. *K.* comes never at me, but I hear my lord Protector is reconciled again, and hath promiſed to be preſent at another proof, which he is to make again either this or next week. Mr. *Kratſhmar* is at *Stratford Bow*; and when I ſee him, I ſhall aſk him what paſſages he moſt approves in the deſigned treatiſe *De Atramentis*. My ſon commends very much young *Kuffler* unto me as a very inventive wit. He doth now make exactly the ſtopples of glaſs to ſtop bottles withal inſtead of corks, which I ſuppoſe may prove a very ſpecial kind of accommodation for preſerving of wine, ale, and all other kind of liquors. My ſon *Clodius* hath alſo received a letter from Sir *K. Digby* with many obſervable things in it. He tells me, that Sir *K.* hath alſo publiſhed of late the treatiſe of the ſympathetical Powder, and, if I be not miſtaken, that he hath gotten or is ſhortly to get a copy of it. The adjoined copy of Mr. *Worſley*'s letter ſeems to have many regular things in it. And I am glad I have gotten a letter again from Dr. *Horne* with thoſe pretty obſervations, occaſioned by my communications of *Martindale*'s new carriages or coaches. The doctor alſo hath ſent me a ſcheme or picture of new invented coaches, which have been in uſe at *Leyden* for ſome years, but only for pleaſure. But *Martindale*'s motion, the like never as yet hath been practiſed, will be not only for recreations, but likewiſe for real profit and accommodations in many reſpects. Juſt now I have given an acquittance upon the receipt of your five favours, to Mr. *Thomas Alſteyn*, which put a new obligation upon me to ſubſcribe myſelf,

Honoured Sir,

your ever faithful, and

moſt obliged ſervant,

SAM. HARTLIB.

SIR *H. Slingſby* was only this day tried before the high court of juſtice, and my lord *Falconbridge* is gone with a very magnificent train to the king of *France* at *Mardyke*.

June 1, 1658.

Honoured Sir,

HAVING written largely on Tueſday laſt, and having ſent ſome other letters on Thurſday, Friday by your man and Saturday by the poſts, theſe are only to ſignify, that I had none from your hands by the poſt, that arrived yeſterday. My ſon *Hartlib* has had a very large conference with Mr. Secretary about the buſineſs of learning; and finding him full of frivolous ſuſpicions and allegations, he hath notably pleaded for the juſtice of that affair, and doth not mean to give it over, till he be convinced into better reſolutions. To this purpoſe he hath referred him to Mr. *Jeſſop* (who is a very great and real friend to that deſign) that he may receive ſatisfaction to any of his pretended ſcruples, though they be ſuch, that my ſon can diſcern the weakneſs of them, to ſpeak the beſt of them. Yeſterday the ſecretary went to confer with my lord *Fleetwood* about it, but he will not be able to cope with his cunning ſubtilities. But not a word of all this to any other. By the encloſed you will ſee what Mr. *Worſley* hath written to Mr. *Dury*. To me he writes as followeth. " Your laſt hath " confirmed me in that, which I had only " before a probable but grounded gueſs " of, *viz.* that upon other pretences the " doctor had a mind to divert that revenue " from both thoſe perſons, and thoſe upright, " honeſt, and ſincere aims, for which it was in- " tended, and under the notion of the ſtates care " to put himſelf into the management of it. " But if this revenue may not be managed " entirely

" entirely amongſt ourſelves, who underſtand " the aims, hearts, lives, principles, and ſpirits, " one of another, I mean Mr. *Boyle*, yours, " Mr. *Dury*, Mr. *Sadler*, myſelf, or Mr. *Beale*, " (whoſe piety, integrity, and worth I have " a confidence of) it ſhall never be raiſed to " ſerve the outward glory or luſt of another " man. If the ſtate have a mind to ſet up " ſuch an inſtitution, let them do it of their " own, and diſpoſe it to their own miniſters. " If other men are willing to lay a founda- " tion of ſo much good, let not the ſtate " hinder them by interpoſing amongſt them. " For in theſe things every man is free, nei- " ther can any man be obliged but according " to his own pleaſure and through his own " ſatisfaction. But if the ſtate have a mind " to try or compare themſelves with the do- " nors, let them give us but a ſmall revenue, " and leave it to us. Let them take a " greater, and let the emulation of doing " moſt good, and being moſt faithful to the " publick grow between them and us. And " conſider, who can loſe by ſuch an honeſt ſtrife " as this is. And let this be propounded as " an expedient between us, all which I ſhall " deſire you to communicate both to Mr. *B.* " and Mr. *D.* And for as much as Mr. *D.* " may have an opportunity to ſpeak with my " lord Protector, my lord *Fleetwood*, and others " about it, as alſo with Mr. Secretary himſelf, " I have given him the trouble of a few lines " in it, that as you have well hinted, there " may be a joint harmony and concurrence " of opinion and judgment between you, " when you ſhall either of you ſpeak with " him or any other about it. But if this " ſhould be croſſed, I ſhall then expect and " truly be in hope of ſome thing elſe (which " perhaps I have ſome diſcernings and con- " jectures) that the lord will raiſe, wherein no " man ſhall have any glory to take to him- " ſelf, nor any power or ſubtilty given him " to hinder it, and which particular I think " plainly to be very poſſible. But this, as " alſo his whole work to be brought forth " in his own time, and by his own means, " is to be left to the Lord." The letter is dated May 26. But what is that ſomething elſe, which the diſcerning man is in expectation of? Can you, Sir, reſolve it out of your former letters? I had by this very poſt a letter alſo from Mr. *Wood*. And though I thought I had ſo fully engaged both his honeſty and intereſt to help to diſpatch this buſineſs, yet now he writes. " For the buſi- " neſs of advancement of learning, I ſhall " wholly refer you to Mr. Secretary, who " can much more exactly inform you of the " true ſtate thereof, than I write, had I ne- " ver ſo much leiſure." Really I had expected a more generous anſwer from Mr. *Wood*. Sir *Robert Honywood*, lately arrived out of the *Low Countries*, tells of a ſingular invention found out there, of a clock, that goes moſt exactly true without a balance, which needs not to be wound up but once in eight days, the price of it being 7 *l.* ſterl. Mr. *Palmer*, who hath a ſhop as it were of all manner of inventions, is to have one ſhortly. And *Fromantile* having heard of it, gives out confidently, that he is able to make the like, or rather to exceed it. I am wonderfully troubled at Mr. *Brereton*'s deſerted condition. I fear the next news you will hear, will be, that he is in priſon, there being four judgments out againſt him. I ſuppoſe you have heard of the launching of the gallant ſhip laſt week, which was called the *Richard*. There had like a very ſad thing here fallen out at that time; the wildneſs of the horſes running away with my lord *Richard*'s coach, and breaking it altogether into pieces. My lord Protector was in it with major *Beake* and Mr. *Pierpoint*, as I take it, but none had any hurt, God be praiſed, but major *Beake*, who received ſome wounds. I am perſuaded the good angels had a ſpecial care of my lord Protector. The approaches are come to the walls of *Dunkirk*, whither my lord *Barrimore* and Mr. *Henry Laurence* are gone with a great number of other Engliſh gallants, as likewiſe out of *France*, to ſee the ſiege of that neſt or den of pirates. And though the chief witneſs againſt Dr. *Hewet* be eſcaped, yet there are ſo many other evidences againſt him, that it will go very hard with him. Thus preſenting you the promiſed learned papers, which could not be ſent on Saturday laſt, I reſt,

Honoured Sir,

your ever faithful obliged ſervant,

SAM. HARTLIB.

June 8, 58.

Honoured SIR,

I AM ſo out of love with my tormenting pains, that I have never a good will to mention them, but when they may be an occaſion of uſhering in ſome good communication or other; for the eaſe and health of many. This made me ſilent in my laſt, to complain of my wonted pains. But having gotten ſome new diſcovery from our common friend at *Dublin*, I can pardon myſelf, if I continue to ſay, that my body is ſtill full of pains, though not ſo violent, God be praiſed, as heretofore, I voiding ſtill abundance of little ſtones and gravel. But the diſcovery is preſented in theſe words: " Near *Lambeth*, or " at the farther end of it, is a houſe, where " they make braſs of copper and lapis cala- " minaris. The pots of which metal do, in " the melting, ſend forth ſtore of white " flowers, or flores. Theſe are without any " thing of corroſiveneſs, and a moſt precious " medicine for your ulcer, if the Lord pleaſe " to ſucceed it, and that you can apply them." Thus far the diſcovery, which I muſt confeſs I like far better than thoſe ſalivations you were pleaſed to ſpeak of in your former. I received your civilities on Mr. *Beale*'s behalf, who wrote, before I got that letter, as fol-

loweth. " I ever pray for the right honoura-
" ble lady; ſhe pleads for favour and coun-
" tenance towards me; I cry out for common
" juſtice, that our enemies may not glory in
" our injuſtice againſt ourſelves. Without
" vanity I may ſay it, that I think I am the
" only man, that has ſo perſonally and cor-
" dially ſerved, and by my education am
" fitted to be ſerviceable, with ſome credit,
" in many relations, in moſt of the chief parts
" of *England*; and yet, that am ſo caſt off from
" favour, juſtice, or common mercy. But
" I thank God, who hath given me a heart
" above theſe things; and I think I ſee his
" providence in it, that, to puniſh my old
" pride, in the very flaſhes of falſe learning,
" he hath now placed me under the feet of
" them, that hate and abhor holy induſtry
" and true learning. If I could diſcern my
" preſent guilt, I hope I ſhould rather en-
" deavour to reform myſelf, than be willing
" to dwell in this furnace. Here I am ſick
" of a parochial labyrinth. But *thy will be*
" *done in earth as it is in heaven.* The holy
" angels, at thy command, muſt wait upon
" us poor mortals; and what am I, ſinful
" wretch, that I ſhould diſdain, at thy plea-
" ſure, to lye under the feet of the worſt
" of mankind!" The letter is dated May 27. Thus I was going to have anſwered to the other paſſages of your laſt of June 5, but that Mr. *Brereton*, Mr. *Dury*, and Mr. *Hack* have taken ſome hours from me in relating and repeating, or collating, the particulars of the great news, as they have been brought by ſeveral meſſengers, which alſo will be printed againſt Thurſday next. The ſum of all is, that the whole Spaniſh army, coming to raiſe the ſiege of Dunkirk, is totally routed, and the foot wholly overthrown. Some thouſands taken priſoners and ſlain. Very few on the Engliſh or French ſide. The marſhal *Hocquincourt*, that lately delivered *Heſdin*, killed; P. *de Condé* taken, but let go again; the general *Caracene* taken, with a number of other grandees. Some of the *Stuarts* were preſent in the battle. But the courage of the Engliſh ſoldiers was moſt inſtrumental in the victory; inſomuch, that marſhal *Turenne* gives an account to the king in no other words, but that the Engliſh had carried themſelves above men. We now do expect to hear daily of the taking or ſurrender of that piratical den of thieves. The court of *France* hath taken ſo kindly the viſit of his highneſs, in his ſon-in-law, the lord *Falconbridge*, that they are reſolved to ſend no leſs than four ambaſſadors to requite the ſame civility; one from the king, another from the queen, the third from their brother, the duke of *Anjou*, and the laſt from *Mazarin*. My lord *Falconbridge* is returned, and cannot ſufficiently expreſs the great reſpect and entertainments he hath found at that court. But he could not prevail with his highneſs here for a longer reprieve of his uncle, Sir *H. Slingsby*, who was beheaded this day upon *Tower-hill* (with Dr. *Hewet*) which was all the favour ſhewn them, who were ſentenced by the high court of juſtice to be hanged, drawn and quartered. They offered, when it was too late, confeſſing their own guilt, to diſcover the bottom of the whole plot. Laſt Friday his highneſs and council, apprehending no ſmall danger, even unto *England*, in caſe the foreſaid ſiege ſhould be raiſed by the reſolved formidable Spaniſh army, kept a private faſt; and on Saturday night they had a return of their prayers, which hath filled *White-hall* (and more places alſo) with triumphant joys. The imperial election, if it be not paſt before this time, will be farther off than ever. Mr. *Brereton*'s father hath at laſt condeſcended to ſupply him with three hundred pound, being fallen very ſick. Thus I am conſtrained to haſten and to conclude, but remain profeſſedly ever,

Honoured Sir,

your truly faithful

and aſſured ſervant,

S. HARTLIB.

Aug. 10, 58.

Honoured SIR,

I HOPE you are ſafely arrived at *Oxford*. Theſe two or three days my pains have been very much decreaſed, God be praiſed. But Dr. *Petty* hath taken away above two hours from me, which ſhould have been devoted to your ſervice. The Dr. ſeemed mightily to be ſurpriſed, when he underſtood you were gone out of town, with ſome kind of jealous intimations, becauſe I did not direct him to your lodging. But I anſwered, that, when that queſtion was made unto me, I really did not know your lodging. I had lately received a letter from Mr. *Oldenburg*, amongſt other particulars, in theſe words: " In our paſſing through *Mentz*, we met with
" a rare artiſt, called *Becker*, a young man,
" who hath found, he ſaith, the perpetual
" motion, the poſſibility whereof hath been
" hitherto ſo much diſputed by philoſophers.
" He hath almoſt finiſhed a work, wherein he
" doth demonſtrate his invention, which we
" have ſeen, and the deſign and way where-
" of the maſter told me himſelf, he would,
" within a very few weeks, put in print here
" at *Francfort*; which being done, I ſhall
" ſend you a copy of it. I am told here, that
" Dr. *Petty* hath a commodious way of print-
" ing, called, *inſtrumentum Pettii*, very con-
" venient to carry about, and to print in tra-
" velling ſome few ſheets of paper, if occaſion
" preſent itſelf. If you have or know it, I
" entreat you to communicate it unto me.
" July 18, 58." The doctor laughed at the invention of the perpetual motion, and denied to have any ſuch inſtrument of commodious printing. Moſt of the time was ſpent in telling the contrivance of his great deſign, upon which he was reſolved to ſpend two thouſand pounds, not doubting but that he would be a

good gainer in the concluſion of it. The deſign aims at the founding of a college or colony, of twenty able learned men, very good Latiniſts, of ſeveral nations, that ſhould teach the Latin tongue (as other vulgar languages are learnt) merely by uſe and cuſtom. This, with the hiſtory of trades, he looks upon as the great pillars of reformation of the world. I wiſh you could handſomly preſent unto him, how he hath defeated me of two hundred and fifty pounds a year (for which I have to ſhew ſome of the donors own hands) by undermining that more univerſal deſign of learning, upon which I have been made to hope theſe two years. Mr. *Brereton* writes, " My ague " hath almoſt left me (thanks be to God) and " my ſtrength begins to return, though ſlow- " ly." The letter is dated Aug. 7. No poſts this week out of *Ireland*; but ſome unexpected lines from Mr. *Pell*, in theſe words. " I pray " you, give ſpeedy notice to Mr. *Moreland*, " that I am here. There was once a reſolution " of ſending a ſhip for me. I fear I ſhall not " here find a fit ſhip before one may be ſent " hither." *Fluſhing* in *Zealand*, Aug. $\frac{3}{13}$. The vice-chancellor of *Cambridge* was with me laſt week, entreating me to ſound him, whether he would be willing to lay the foundation of a mathematical profeſſorſhip in that univerſity. If I find him to be, the univerſity is as good as reſolved to petition his highneſs about him, as ſoon as he is arrived. My lord *Montague* ſent orders yeſternight for a ſhip to fetch him from *Fluſhing*. Doctor *Kuffler* was with me on Monday, telling in what words you had congratulated the ſucceſs of his terrible deſtroying invention. He thinks it not fit to preſent himſelf to his highneſs, till the funeral of my lady *Claypole* be over. Her corps was to be brought as this day by water from *Hampton-court*. My ſon *Clodius* promiſed to write by this poſt. I would fain have the particulars from your own relation, which you were pleaſed to tell him of divers curious inventions, ſhewn you lately by a certain Walloon. Here you have, beſides the promiſed papers of the glaſs ſtopples, a notable anſwer from *Hereford* to Mr. *Worſley*'s olfactiques, which I imparted unto you at *Marſton*. Mr. *Beale* writes in his laſt, " We " had here about eleven of the clock, on " Wedneſday night, one great crack of thun- " der, that hath turned all the beer and ale of " this neighbourhood into giddineſs. I did not " think, that ſo much hurt could be done to " drink by ſuch a ſhort crack. Can any ſtopples " preſerve the liquor from this annoyance?" Thus far he. This day Mrs. *Dury* with her huſband went from hence to conduct Mrs. *Worſley* to *Cheſter*; from whence they intend to give a viſit to Sir *Richard Saltonſtall* at *Wrexam*. Within three weeks, God willing, they hope to be back at *London*. I remain ever,

Honoured Sir,

your faithful ſervant,

S. HARTLIB.

Sept. 14, 1658.

Honoured SIR,

MY laſt was on Tueſday. I forgot then to add one of the beſt remedies, that my ſon *Clodius* knows againſt the Eryſipelas, which I tranſmitted to Mr. *Beale*, in theſe words. *Cape Rob. baccarum ſambuci & ejus unciam unam in aquæ florum ſambuci unciis ſex diſſolve, & hac mixtura aſſumta tegatur æger ſtragulis, quam diligentiſſime, ut largiter ſudet. Hoc ſecunda quoque & tertia repetatur vice, ſi prima non cedat malum.*

THUS far I began to expreſs my reſpects laſt Thurſday, but was forbidden to proceed by the extremity of moſt violent torments, which caſt me into my bed, as into a grave. And though I be riſen this day again, yet I conflict with inexpreſſible torments, and which will ſuffer me only to ſignify the receipt of your laſt of the 11th of September. Nor is there much to anſwer to the contents thereof. Only I am mightily tormented alſo at the loſs of your excellent meditations (of the Uſefulneſs of Natural Philoſophy) which will now be more ſeaſonable than ever, for that I ſuppoſe, that his Highneſs, that now is, will perhaps more favour deſigns of ſuch a nature, than his deceaſed father, otherwiſe of very glorious memory. I have received the *Maſcon* books, and do return you my moſt humble thanks for them. I ſhould be glad to hear your account of Mr. *Beale*'s papers, concerning cyder as a winy liquor. But I believe Mr. *Auſtin* did not impart unto you a copy of his own letter, as his judgment upon them, which I have done here by ſome of the adjoined papers. But you need not to let him know any thing of the exerciſe of this my well-meant charity. My ſon *Clodius* is under new trials, his wife being brought to bed this night of a child, that died ſoon after, the mother remaining very weak. He wrote to you laſt Saturday. His chemical college or laboratory will not be ſo much proſtituted as you fear. But there was an abſolute neceſſity to reſolve upon ſuch a courſe amongſt a few confiding friends. There are near three furnaces finiſhed, but five more muſt be added unto them. And having theſe, they ſhall be able to command any kind of operation whatſoever. I know not how he will be able to diſpoſe of his buſineſs, ſo as to give you now a viſit at *Oxford*. But I ſuppoſe, that ſome occaſion or other, in theſe changes of publick affairs, may invite you to *London* ſooner, it may be, than you had reſolved. If you come, if the Lord ſpare my life, we ſhall be able to ſpeak more freely about thoſe ſecret papers and paſſages, by me imparted. My lord *Broghill* is written unto from *White-hall*, to come away with all poſſible expedition. But my lord deputy of *Ireland*, I hear, is not now likely to come, being to look the better to the publiſhing of the new ſucceſſion. I do not remember to have told you of the like charitable deſign to be founded at *Durham*; I mean of a charitable phyſician, or laboratory, for the poor. I have

but one copy of it in print, being only diſperſed by private communications. But yeſterday I received a letter, wherein I am promiſed to have ſhortly more copies. As for my ſon's charitable deſign, though the reaſons, which are alledged againſt it, ſeem to be weighty, yet thoſe other conſiderations, which the propoſer can ſhew for it, are not to be ſlighted. When you meet, God willing, they may both be laid into juſt balances. The more particular account of Mr. *Stahl*'s way of ſtudy, and of his opinions, will be fitter for a diſcourſe than writing. Mr. *Brereton* reſolves to be in *London* about the 25th of this month. He writes ſadly. "A ſhip was "caſt away about three weeks ſince, going "for *Ireland*, about four leagues off *Holy-head*. "They ſay here, it was by a ſpout, or fall-"ing of a cloud, and that divers perſons of "quality (others ſay ſixty in number) were "there loſt: not one man, and but two "dogs (one whereof upon a plank) were ſav-"ed." The letter is dated, September 11. I hear nothing yet of the arrival of Mr. *Worſley*, nor of Sir *George Wentworth*, our neighbour, who, they ſay, was in it, with all his family, expecting his eldeſt daughter, who could not be perſuaded to go into *Ireland*. I hope it is not true. But thus much is certain, that he carried two dogs along with him. There is alſo a ſecret whiſper, as if my lord *Bradſhaw* was departed this world in *Cheſhire*, which, if true, is one of the ſaddeſt and moſt piercing news, that can befal,

Honoured Sir,

your faithfully devoted,

SAM. HARTLIB.

I HAVE not time to read over what I have written.

December 16, 1658.

Honoured SIR,

HAVING written laſt week two letters, and ſent alſo a great packet with letters from *Ireland*, I did not write on Tueſday, not hearing of the receipt of any of them. But yeſterday I received the acknowledgment in your laſt of December 14, with the three books of Dr. *Willis*'s fermentation, for which I would have you returned, not only my humble thanks, but likewiſe thoſe books, which I have enquired after, in *Paul*'s *Church-yard*, if I could have gotten them. I am wondrous glad, that you have written of the preſent protector's intentions for countenancing and advancing of univerſal uſeful learning in due time. I had, by the laſt poſt out of *Germany*, in my learned letters, ſome paſſages of ſpecial importance, tending that way. I mean, about the care of magiſtrates, for ordering and improving of learning, and a purpoſe for drawing up a ſolid and handſom diſcourſe, for a ſtanding council of learning, how it may be rightly conſtituted to work out, without any noiſe and diſturbance, a real reformation and advancement in all manner of literature. I ſhall now ſtir up the gentleman to elaborate ſuch a diſcourſe, he being of vaſt and excellent parts; and if I ſhould tell his name, perhaps, not unknown to Dr. *Wilkins*, when he travelled beyond the ſeas. My humble and faithful ſervice to the doctor, who ſtands ſo nearly related to his highneſs, letting him know, that I hope to ſee him not only made provoſt of *Eaton* college, (though my lord preſident had obtained the grant of it from his late highneſs, after the deceaſe of my lord *Rous*) but likewiſe preſident of the forementioned ſtanding council of univerſal learning. I hope likewiſe, that the Lord will make your worthy ſelf eminently inſtrumental for carrying on that deſign, upon that, or any other the like favourable either publick or private occaſions. Mr. *Dury* told me, on Monday laſt, how that captain *Shaine* would have ſhortly a meeting of Mr. *D.* Dr. *Petty*, and himſelf, at my new houſe, to contrive and determine the way of promoting this very buſineſs as to the hopefulneſs from *Ireland*, the adventurers being bound, by the act of parliament, to allow, and ſet out, the ſum of ten thouſand pounds for ſchooling and learning in that country; of which I ſhall not fail to give you a farther account in due time. But *Anthony Pearſon*, the Quaker, is gone away per poſt laſt Saturday, not having performed his promiſes towards me. I am ſending to *Calvert* the ſtationer, to enquire, whether he have left any papers of huſbandry with him for me, or promiſes to ſend them up with enlargements, of which he ſpoke likewiſe unto me. As ſoon as I have heard, one way or other from him, you ſhall be ſure to be acquainted with it. In the mean time, I beg the communication of the promiſed great myſtery of huſbandry, if you become maſter of it. I ſhall carry myſelf, in the concealing or ſpreading of it, as you ſhall pleaſe to preſcribe. My chemical ſon's head and hands are much taken up with animadverſions on Dr. *Willis*'s book, he having very great and clear reaſon and experiences to diſlike very many particulars in it. But, no doubt, of this he will write himſelf; I ſhall carefully ſend the books to Mr. *B.* and Mr. *Worſley*. But I ſhall impart, what he ſo triumphantly and confidently writes to a confiding friend of his in theſe words. "My dear friend, raiſe up yourſelf, be cheer-"ful, comfort yourſelf indeed, and comfort "all our friends in the faith and expectation "they have of the glory to be revealed, and "of the faithfulneſs of the making good the "rich promiſes of God to his people, even "forthwith. For, believe me, and believe "alſo, I would not knowingly abuſe you: "and if you may receive any thing certain "from me, then I can, I dare, I do aſſure "you, I have ſeen, or heard, or been in-"formed of that, yea ſo much of that glory "now to be revealed, as I am not in fancy, "not in imagination, but in ſobriety and "judgment, well aſſured, that when the "Lord

" Lord ſhall really uſher it into the world, " (and that he may do, for any thing I know, " in a few, it may be very few months) all " the force that can be made in the world, " will not be able to reſiſt it. But it ſhall " root, and it ſhall prevail, until darkneſs be " wholly tumbled down, and confuſion itſelf " ſhall be wholly confounded and brought " to nothing. And believe it, my true friend, " this word is certain: for that muſt of " neceſſity work powerfully and ſtrongly, that " hath the counſel and decrees of God to go " along with it. And there is not the leaſt " part of that faith and hope I now declare " to you, that is built upon man, but upon " God, and upon the certain counſel, wiſ- " dom, and faithfulneſs of him, who perhaps " will, before we are aware, cut his work ſhort, " and will put an end to all gainſayers." The letter is dated Nov. 20, 1658. But of his *Tractatus Tractatuum* I cannot learn as yet any thing. My humble thanks for your continued care to Mr. *Haughton* on my behalf. Yeſterday the writs (upon new conſiderations) of parliament were ſent by a meſſenger into *Ireland*. Some fear there is of a breach between us and *France*; but my lord *Lockhart* is haſtening thither. Mr. *Dury* is fallen very ill. Mr. *Needham* told my ſon, that my lord *Broghill* was at *London*; but upon ſending thither, there was no ſuch matter.

ONE of his highneſs's daughters died lately in the country.

N. B. By this very poſt I have ſent a big packet with letters from *Ireland*.

April 5, 1659.

Honoured SIR,

YESTERDAY I received ſome part of your anſwers to my ſeveral letters, which were very welcome, but that I am extremely troubled at the ground of hindrance, that would not ſuffer you to enlarge yours upon the other particulars. My ſon's maid fell ſick laſt week of an ague, but by God's bleſſing upon the uſe of that powder, which he got from his new acquaintance, ſhe is in a very hopeful way of a perfect recovery. No doubt himſelf will write concerning ſalt cornu cervi, or that other medicine; at leaſt I have done my duty in obeying your commands. When theſe holy-days are over, I ſhall cauſe very diligently to acquaint myſelf about *Mary Rant* and her writings; for I have not only now, but very often, been importuned heretofore on her behalf. Dr. *Horne* owes me a large anſwer to a letter accompanied with many communications, ſo that I do not intend to write to him again, till he hath given me an account of them. Both *Voſſius* and *Horne* are two notable learned men, ſo that we may juſtly expect ſome extraordinary performances in their extraordinary undertakings or encounters. I beſeech you to favor me with the firſt notice, when thoſe ſo much deſired chronological labours of the late worthy biſhop of *Armagh* are come out of the preſs, that I may ſend a copy of them to the learned doctor at *Leyden*. I ſhall endeavour to inform myſelf the beſt I can, concerning the way of making ſaltpetre out of ſea-ſalt. I wonder, that Mr. *Worſley*, that was one ſo hot upon this ſubject, both for writing and acting, hath been ſo much cooled in both reſpects. I wonder alſo not a little at his perverſe and obſtinate ſilence. Mr. *Wood* gives no other account but " Dr. *Worſley* is not yet " returned out of the country, but is well " there, for ought I can hear." Thus far he, the letter being dated March 21. Concerning the inſtrument of catching and condenſing the ſun-beams, I have a promiſe of a large account from Mr. *Morian*. But whether he ſhall get leave to reveal the way, which the adeptus, who is with him, doth uſe in the philoſophical work, he cannot yet aſſure me of. The anſwer of Mr. *Pocock* to the Turkiſh queries (which are very ſeriouſly made) will be very acceptable, if it can be procured. I thank you heartily for the printed paper of coffee, which will be guſtful no doubt to your coffee drinkers, and who perhaps may add as many more good obſervations from their own experience, as the Arabian phyſician hath done. Is the philoſophical figment under the preſs? Dr. *Worthington* told me huge commendations of it. I ſhall not be unmindful of your commands to Mr. *Oldenburg*. In my laſt on Saturday I ſhould have added the following lines, wherein he has anſwered to ſome of my former deſires. " At preſent " I have nothing elſe to ſend you, than what " I promiſed to ſome of my former, *viz.* " Mr. *Becker*'s Argonautick invention, which, " if practicable, as well at ſea as in a model, " would certainly excel moſt inventions that " ever were deviſed. There are many con- " ſiderable things in it, which if he be able " to put in practice (as in the end he ſaith " he hath done heretofore already, blaming " withal that famous and raſh undertaker at " *Rotterdam*) he were worthy to be crowned. " In the interim ſuch kind of men ſhould " be ſome long time converſed with, and " ſome expences hazarded by liberal enter- " tainments, to get their familiarity and affec- " tion; after which they will more eaſily be " induced to diſcover themſelves and the " depth of their knowledge." The queſtions, which he propoſes to me, are theſe. I pray give yours the trouble to aſk, whether the book called *vulgar Errors* of Dr. *Brown* be tranſlated into French or Latin, or any other language, and acquaint me, with it by the next. Laſtly he adds a word or two concerning the French publick affairs. Here is a ſtrong rumour of a peace between France and Spain, though I think it nothing but a trick of policy, for to daſh the plottings of diſcontented people here, and to give them hopes of that quiet, which they deſire after ſo long and exhauſting a war as this hath been. Of our parliament publick affairs I have no mind to write. The debates for ſome days have been only about the act of a ſolemn faſt, that it may be publiſhed in the name of his highneſs

highneſs and the parliament, but not of both houſes of parliament. For there are new debates riſen about not tranſacting with the other houſe of parliament, till their bounds be firſt ſtated and determined. The army is coming to deliver their petition about indemnity. Juſt now my ſon *Clodius* ſends the encloſed. When he was with me this afternoon, he was admiring the great ſtones, that were come away this night from me; but though I remain ſtill in woful torments, yet I muſt ſubſcribe myſelf ever,

Honoured Sir,

your entirely devoted,

S. HARTLIB.

SIR, the Argonautick invention cannot be written out, but muſt be deferred till the next occaſion.

April 12, 1659.

Honoured SIR,

THESE are to return my humble thanks for your laſt having no date, but I ſuppoſe written on Saturday laſt. I did not write ſince my laſt of April 5, having very much overloaden you as I feared, and being very deſirous to have an anſwer to divers particulars in thoſe learned communications, which now alſo for the moſt you have given. As for Mr. *Pocock*, I dare not reiterate my former requeſt, leſt it may prove, as you alledge, a prejudice to better and greater occaſions. Here you have ſome extracts more of Mr. *Beale*'s on the optical argument. He will be very glad to hear, that the ingenious gentleman of *Greſham* college is engaged by you to make particular enquiries into that ſubject (which I ſhall carefully certify our Herefordian friend;) but I ſhould be more glad, if you could obtain copies of what he ſhall deliver (concerning the commendation and perfection of teleſcopes) in his publick lectures. At *Copenhagen* the former king had impoſed the printing of all the profeſſors lectures in that univerſity. I am heartily glad that your ague deals ſo civilly with you, but you do not tell, whether my ſon *Clodius* has ſent you ſome dozes of his new adeptus's powder, as I earneſtly begged of him. Our maid is perfectly cured, by God's bleſſing upon the uſe of that medicine. The packet with books, which I have ſo long expected out of *Holland*, hath been twice at ſea, as I was adverti ſed the laſt week, and that it was now again on the way the third time. As ſoon as it is arrived, you ſhall preſently have all your deſires. Laſt Friday I did write to Dr. *Horne* about the experiment of making ſaltpetre out of ſea-water. Mr. *Beale* has been pleaſed to ſend me his ſuggeſtions for Dr. *Horne* in dealing with *Voſſius*'s new chronology. By the next occaſion (if my torments put it not out of my mind) you ſhall have a tranſcript of it. In the mean while here I preſent you with the promiſed Argonautick invention of that *Becker*, with whom Mr. *Oldenburg* is come acquainted in his travels. But I am ſorry the Latinity of it is ſo imperfect and mechanick. The foreſaid gentleman writes in his very laſt as followeth. " I have had ſome " diſcourſe with an able but ſomewhat cloſe " phyſician here, that ſpoke to me of a " way, though without particulariſing all, to " draw a liquor of the beams of the ſun, " which peradventure ſome perſon, that is " knowing and experienced (as noble Mr. " *Boyle*) may better beat out, than we can, " who want experience in theſe matters. The " proceſs, as far as I could underſtand him, is " this. You muſt put a couple of pounds " of good mercury into an alembick, luting " the head thereof as well as is poſſible, to " the end that nothing exhale, and expoſe " the ſaid alembick into the ſun againſt a " wall of reverberation in the hotteſt time " of the year; upon which he ſaid the mer- " cury would after ſome time draw the ce- " leſtial ſpirit, and coagulate it into a yel- " lowiſh liquor, that would be a conſiderable " diſſolvent. So much he ſpoke in groſs, " which I pray communicate with Mr. *Boyle*. " At the firſt I would not have it go farther " than to Mr. *Boyle*, and according as he ſhall " judge of it, we may proceed farther." Thus far the very formalia of his letter. Alas! good gentleman! *Pauperis eſt numerare pecus*. I ſhall be able ere long to communicate other kind of proceſſes on that argument. I long to ſee your ſecret of univerſal (as I take it) huſbandry. Dr. *Kuffler* is moſt confident of his ſecret for improving of ſandy or any other barren land. He is ſo much in love with it, in reſpect of the promiſing or rather certain gain, that will moſt abundantly redound to him, that if he could get any partners, or any other encouragement or aſſiſtant for it, he would willingly deſiſt from all eager purſuits about his dreadful and deſtroying invention. I humbly beg, that you would not leave him, till he have diſcovered that ſecret of huſbandry, at leaſt into your boſom. He is very poſitive, that many thouſands may be gained by it. He ſays, the means are altogether natural, being a very ſlight thing, and that it is continually obvious to every body, but yet obſerved or improved by no body. I ſhall not fail to be mindful of your commiſſion to Mr. *Lynner*, by the next occaſion I write unto *Ireland*. I alſo purpoſe to look out thoſe papers (as ſoon as the extremity of my torments will give leave) which have anſwered my interrogatories for *Ireland*, in reference to barnacles. I pray be pleaſed ſo to mind that excellent little treatiſe, you mention, of the propagation of all ſorts of plants, that I may have the firſt notice of it, before it be flown abroad. If you have a mind (ſays my ingenious correſpondent) to oblige Mr. *Pitt* and Sir *Thomas Hanmer* of *Flintſhire*, and Mr. *Rea* of *Shropſhire*, all three exquiſite floriſts, and Mr. *Rea* ſhortly to furniſh the preſs with a treatiſe of note on that argument, you may with

" with the ſame arrow hit the mark to all " three." And again, " For though Mr. " *Pitt* ſends me his rarities of ſeeds and " plants, yet I fail not to gratify him. Mr. " *Rea* brought up his hortulan labours to " *London.* It required many coſtly cuts, " which ſo affrighted the Stationers, that " they offered him but thirty pounds for " his pains. This diſpleaſed him ſo much, " that he brought home his manuſcripts. I " told Mr. *Pitt*, that I had no vote for any " man, that demanded a patent or a price for " his merit towards the publick." I ſuppoſe you have ſeen the Petition of the army, which is no ways liked. But they are more reſolved and daring in their meetings, conſultations, and orders, which cannot be hindred. But clouds begin to gather apace, and the chiefeſt amongſt them have no other apprehenſions, but that it muſt come again to blood. My lord *Craven* is permitted to come over. I had forgot to ſignify, that Dr. *K.* deſires earneſtly my lord *Broghill*'s protection, under the notion of being phyſician to his family; for he ſays, that ſuch protections are, during parliaments, ordinary and precedential; which, if it may be obtained in time, will be a huge benefit unto him. For now he dares not go upon the ſtreets to follow his buſineſs, for fear of being arreſted. But ſuch a protection would ſave him from all his creditors, for a time, in which he hopes he may be put into a better condition. I ſhall not fail to ſpeak to your truly compaſſionate and noble ſiſter, begging your ſeconds, as remaining ever,

Honoured Sir,

your moſt faithfully devoted,

S. HARTLIB.

Axe-yard, April 16, 1659.

Honoured SIR,

I WROTE largely on Tueſday laſt. Since I have been moſt grievouſly tormented, both days and nights. I had many things to enlarge upon, but the pains are ſtill ſo great, that I have much to do to write a very few lines. Mr. *Beale* wrote ten days ago, that he was ſorely afflicted with a moſt terrible cold. But having not written to me all this while, I fear his diſtempers are encreaſed upon him. I ſaw an excellent book yeſterday, coming piping hot out of the preſs from *Cambridge*, called, *The Immortality of the Soul, ſo far forth as is demonſtrable from the Knowledge of Nature and the light of Reaſon. By Henry Moore, Fellow of Chriſt's College in Cambridge.* Mr. *Tompſon*, at the White-horſe, hath part of the books. I had a few lines again from Mr. *Wood* at *Dublin-caſtle*, who writes, " We have tried " your experiment upon one or two ſick " horſes, with good effect. I thank you for " it, as alſo for your ingenious Herefordian pa- " pers." Dr. *Petty* writes to my ſon, " Keep " all your friends from prejudice, until I be " heard, and make them mine, till the leaſt " guilt appear in me." My ſon went down with the orders of the houſe for my lord *Craven* to come over, giving him protection for ſix months. He hath ſtayed out ſo many days, that we begin to apprehend he is gone over into the Low-countries, which alſo is no ſmall trouble unto me for the preſent. The officers of the army have ſtill their meeting, and will not be controlled. They are reſolved to juſtify the execution of *Charles Stuart*, but not the government by a ſingle perſon, but rather a commonwealth. They are reſolved againſt Preſbyterianiſm, and will have allowed an univerſal liberty of conſcience. They ſay they have ſent to the trained-bands of *London*, to know, whether they will ſtand by them or not. They are for a commonwealth, or for eſtabliſhing a military great council, *&c. &c.* Next week it is feared their declaration will come abroad. This day a great multitude of Quakers were admitted to the houſe; but they would not obey their orders nor commands, ſo that Mr. ſpeaker told them at laſt, they were a company of people, that were againſt magiſtracy and miniſtry; and ſo they were diſmiſſed. The houſes have begun very reſpectfully to tranſact with each other, by members of their own, in their reſpective houſes. It is ſtill more and more confirmed, that the match and peace between *France* and *Spain* will ſuddenly be concluded. There is an expreſs come, that our fleet is ſafely arrived in the *Sound*. The Holland fleet is not yet at ſea. Thus, praying heartily and inceſſantly for your health, as a moſt publick bleſſing, I reſt ever,

Honoured Sir,

Your moſt aſſuredly devoted

S. H.

THE adjoined paper is worth your beſt peruſal.

Axe-yard, April 19, 59.

Honoured SIR,

MY laſt was on Saturday. Theſe are to acknowledge the reſpect to your laſt of April 16. I humbly thank you for the imparting of the ſecret of huſbandry. But by the adjoined paper you will ſee it is no ſecret to me. I did a year ago impart a copy of it to our Herefordian friend. But methought he was not much taken with it, though it coſt me, for the gaining of it, above fifteen pounds ſterling. My ingenious friend concluded (as far as I remember) that the poſſeſſor of it, from whom I had it, had but little ſkill in huſbandry. He made alſo many other obſervations and animadverſions upon it, which I thought to have given you, but that I cannot find Mr. *Beale*'s letter, written upon that occaſion. Sir *Charles Culpepper* had it from my communications above a year ago. He ſeemed to approve more of it than Mr. *Beale*, and I believe has made ſome trial, of

which I ſhall deſire his account, when I ſee him. I remember, that I imparted this huſbandry to Mr. *Worſley* alſo, who judged it, if by experience it ſhould be found true, a particular good menſtruum, but falling very much ſhort of advancing thereby univerſal huſbandry. I beg again, you would endeavour to intereſt yourſelf in that way, which Dr. *Kuffler* ſo highly boaſts of. I could eaſily obtain the deſired protection for him from many parliament-men; but I would willingly improve this occaſion for your greater intereſt in him, by making my lord *Broghill* his protector. I have ſufficiently inſtructed your moſt noble ſiſter in that affair, and make no queſtion, I ſhall have a favourable account from her within a day or two. My ſon *Clodius* promiſed this forenoon, in the preſence of Mr. *Brereton*, to ſend you forthwith, beſides the promiſed things, ſome doſes of the adeptus's powder againſt agues. I am not a little troubled, what is become of my ſon *H.* I ſhall not be unmindful of your commiſſion towards him. The following lines from my dear Herefordian go very near my heart. "Your "two laſt are yet unanſwered. Nor now can "I do more than abbreviate an acknowledg- "ment of your's, without peril of loſing my "ſight totally. I can neither write nor read "without a flux of rheum upon my eyes, "which glues them together, as oft as I ſleep. "I think it no danger, and towards healing, "if I forbear ſtudies one week longer, and "then I will endeavour to anſwer all yours. "I am troubled at Mr. *Boyle*'s ague; but it "is here ſo epidemical, or indeed the leaſt of "maladies, that are amongſt us. I have "lately ſeen ſo many ſmitten with dead- "palſies, apoplexies, and giddineſs, that I "take my own malady for a proof of a ſpe- "cial deliverance. I noted the time, when "I took it, by a very malignant wind in my "neck, through a window, in time of my "duty in the miniſtry. But who can com- "plain of perſonal maladies, when the pub- "lick is ſo much diſtempered?" Thus far he, the letter being dated April 13. Yeſterday I had a letter again from Mr. *Oldenburg*, in theſe words. "Having been more than "ordinary employed in buſineſs laſt week, "and being ſtill ſo at preſent, in changing "lodgings, and putting ourſelves into an "academy, I know you have the goodneſs of "excuſing my omiſſion of not giving you "thanks for your laſt, which I hope to do "amply next week, if God will." The letter is dated April 23. Dr. *Kuffler* has promiſed me the diſcovery of the arcanum of the celeſtial liquor, which, as ſoon as I get, I ſhall not need to be called upon for to let you have a true copy of it. You do not determine the time of your coming up to *London*. I beg your promiſed communications about hatching of chickens. The encloſed paper on that argument I had from Mr. *Pell*. It is pretty to obſerve, that this ſubject is counted worthy of academical conſiderations and trials. Sir *William Paſton*'s ſon endeavoured to make a ſolemn experiment of late, but did not proſper in it. I am fully of your opinion, concerning the Argonautick invention, or the wonderful ſhip. I ſuppoſe you know, that Dr. *Chamberlain* (the man-midwife) is returned into *England*. He boaſts to have the invention of ſailing againſt wind and tide, or with all winds. The invention was divers years ago experimentally demonſtrated by one Mr. *Brewer*, a Scotiſh ſilenced miniſter, who receiving many favours from Mr. *Dury*, when he was impriſoned by the epiſcopal perſecution, then raging, he was pleaſed, by way of gratitude, to reveal the whole myſtery of ſailing with all winds, or againſt wind and tide, unto Mr. *Dury*'s boſom, but not to diſcover it as long as the inventor was alive. He hath ſince been dead theſe many years; therefore let me earneſtly beſeech you, the next opportunity you ſhall have to ſpeak with Mr. *Dury*, to deſire the revelation of the ſaid invention to be made out and improved by yourſelf, and the better ſort of your mechanical relations, that ſo uſeful an accommodation to mankind may not be loſt. I do not care, if you tell him I did encourage you to this freedom, and I am perſuaded he will not deny it unto you. Here you have the votes of the commons, that paſſed yeſterday. My lord *Broghill* was highly commended, that he had ſo effectually dealt with the officers of the army, in their meeting laſt week, that it was apprehended he had broken their deſign, eſpecially the city refuſing alſo to join with them, and Sir *H. Vane* utterly diſowning their proceedings, as moſt deſtructive to the publick peace, and of bringing in of *C. S. &c. &c.* The houſe of commons thought good, as you ſee, to ſecond the hopeful work thus far begun. My lord protector himſelf has ſpoken alſo with our officers, as likewiſe the lord *Fleetwood* and lord *Diſbrowe*; but they are again very daring and high; and the other houſe hath refuſed this day to paſs the 1ſt and 2d reſolves of the commons, *&c. &c.* ſo that all ſeems to threaten a farther confuſion. There is alſo a very ſtrict enquiry made after *C. S.* he being ſuppoſed to be in or near the city. But my pains are too great, and I muſt conclude, remaining ever,

Honoured Sir,

your moſt faithfully devoted

S. HARTLIB.

SIR,

MY amanuenſis hath diſappointed me, that I cannot ſend the ſecret of huſbandry, as it was imparted unto me. By the next occaſion it ſhall be ſent, God willing.

Honoured SIR,

YOUR laſt is dated April 23, forbidding to ſend by the poſt. I am but lately riſen, having been moſt grievouſly tormented all night long, and voided, beſides many little ſtones,

ſtones, a very great one, the like I have not done of late. But I am hugely perplexed about that excellent ſpirit of ſalt, which I ſtill uſe daily, and which certainly works ſo mightily upon the ſtone, having broken and ſplit a glaſs with three ounces of it; the ſpirit, which is ſtrange, having made the glaſs ſo thin, or brittle, that it broke with the leaſt touch in the opening of it. I had a letter from him who made it, I mean Mr. *Stahl*, expreſſing a reſolution to come over ſhortly into *England*. I forgot to write to him about thoſe retorts, in which the ſpirit of ſalt is made, and which cannot be had in *England*, to bring them over with him. My ſon *H.* is returned from *Holland*, with my lord *Craven*; but my ſon *Clodius* is gone to *Graveſend*, to confer ſecretly with monſieur *Schlezer*, who hides himſelf there, to be gone with the firſt fair wind to the king of *Sweden*. I know no more of the powder, which my phyſical ſon ſent, but that it hath cured all thoſe, that have taken it. Mr. *Stroud* hath written to my ſon a confirmation of a ſilver mine, which now he is moſt certain of. After the expiration of ten or twelve months, it will yield him for certain yearly about two or three thouſand pounds a year. I heartily wiſh you may be bleſſed with the like mines. I beg the continuation of as many extracts, *&c.* out of ancient or modern authors, as you can procure on that ſubject of hatching of eggs. My ſon might have prepared ludus Helmontii for me before this time, but he wants bowels. I have not heard this week neither from Mr. *Beale*, which encreaſeth my torments. I ſhould be glad, that the ſecret of huſbandry were ſucceſsfully experimented. I ſhall take ſpecial notice of the new edition of *Hoornbeck's ſumma controverſiarum*. Mr. *Worſley* hath written to you a letter of two or three ſheets long. Will you not pleaſe to acquaint me with the communicable contents of it? Laſt Saturday I imparted the remainder of Dr. *Horne*'s letter, wherein were many obſervable matters. I alſo acquainted you fully with the ſtate of publick affairs; ſince which time, all is kept very cloſe and ſecret. It is obſerved, that my lord *Lambert* hath been with his highneſs alone about two or three hours together. There is an evil eye againſt my lord *Broghill*, for adviſing (as ſome whiſper) to clap up *Fleetwood*, *Diſbrowe*, *&c.* into the Tower. Sir *A. Haſlerig* and Sir *H. V.* came on Monday, notwithſtanding the proclamation, offering to go into the houſe of commons, but the ſoldiers watching them would not permit it, the proclamation being affixed to the doors. The officers and common ſoldiers do not agree. The latter have choſen to themſelves new agitators; ſo that all remains in ſuſpence, and under expectations. Only at eleven o'clock yeſternight I was told, that the army is agreed upon a declaration and engagement, which is forthwith to be printed. Laſt Lord's day his highneſs was obſerved to weep in ſermon-time, which cauſed many ſheddings of tears in others; but yeſterday he was obſerved to be very chearful and merry. Dr. *Petty* made a moſt notable ſpeech before the parliament was diſſolved. I reſt ever,

Honoured Sir,

your moſt faithfully devoted

S. HARTLIB.

A PEACE or truce for fourteen years between *France* and *Spain* will certainly be concluded and publiſhed. Young *Clodius* being now at my chamber, preſents his moſt humble ſervice, ſignifying, that he is near an end of the tranſlation of the two choice chemical treatiſes, called, *The Bawer*.

Incloſed in the preceding.

Hereford, April 13, 1659.

DEBUERAM in noviſſimis meis advertere, quod in ſupputatione Gregorii & Fiſheri toties à me memorati (qui niſi Uſſerianis mihi nondum perceptis cedant plurimam habent accurationis ſpeciem) à mundo condito ad paſſionem Chriſti, quam 34 ætatis anno contigiſſe probabilius videtur, 4000 ſunt annorum, quod monet Fiſherus pag. 31. hiſce verbis: The full time from the creation of *Adam* unto the death and paſſion of our Lord and Saviour *Jeſus Chriſt* is 4000 years and 10 days. *De* 10 *diebus (ſi de iis lis eſſet) ratio myſtica et monitoria facilè occurret, è quibus* 6. *ab Adamo ad creationis primordia*, 4. *ad millenorum cenſum, ubi (ut ait apoſtolus) in oculis Domini una dies pro mille annis cenſenda eſt, & cum* 400. *cub. Ezek.* xlvii. 3, 4, 5. *quadrat. Et hæc eſt periodus, in quâ conſummationen agnovit Dominus. Nihil interim aſſero, omnia argutioribus penitiùs diſcutienda propino; Danielis computum, qui de monarchiis tàm apertè meminit ſaltem Johannis Apocalypticam* 666, *ſi verus in numeris ſenſus eſt, mallem ad periodum in quâ Pompeius Hieroſolymam occupavit, quam ad natalitia Chriſti referre. Nam & ab occupatâ Hieroſolyma ad beſtialem vel belluinam Bonifacii* 3. *uſurpationem, & ad Mahumedis inſpirationem diabolicam non multum abſcedit, imò, quantum in præſens conjicio, omninò congruit numerus* 666. *pro certo hoc vulgo conſtituitur Bonifacium A. C.* 606. *à Phoca obtinuiſſe, ut Roma caput eccleſiarum, pontifex pater patrum & epiſcoporum princeps haberetur. Et hic annus fuit ab occupata Hieroſolyma* 666. *Mahumedes quoque eâ tempeſtate jam nobilis per orientem nequitiarum artibus, inſpirationumque fraudibus, ſummi nomen prophetæ accepit. Nunc non vacat, uter harum ſit rex ille Abaddon ex abyſſo aſcendens Apoc.* ix. *quærere.*

Ideò de computo Dionyſiano ſecundum Gregorium & Fiſherum ſtatum inando toties mentionem feci, qua plurimùm ad futuram millenariorum periodum conducere videtur, & ſelectiora ſunt, quæ hâc cauſâ proferunt illi. Litem hanc in Eutychianis ſuis obſtinatè declinavit Seldenus noſter, ut videre eſt in præfatione, & ad numerum 15. *pag.* 68. *Fatetur interim Eutychium ſuum addere computo Dionyſiano annos octo. Nimirùm Eutychius paſſim in chronologia ſua Chriſti natales octennio facit recentiores, quàm in æra vulgari—Adeoque ex ea*

ratione

ratione Hegiram ab anno Chriſti 614. *auſpicatur, quam unanimes tribuunt chronologi noſtri anno vulgari Chriſti* 622. *& l. c. p.* 68. *ſic ait; De octennii diſcrimine conſonus eſt in anno Nic. Conc.* 1mo *deſignando Doropheus Monembaſiæ metropolita &c.—Sic igitur ut Scal. unum addit annum, Calviſius duos, Laurentius Syſlyga Polonus* 4. *Keplerus* 5. *hi addunt* 8. This is all I can preſent, being always,

SIR,

your moſt affectionate ſervant.

May 10, 1659.

Honoured SIR,

I WAS in good hope we ſhould have ſeen you before this time: but as long as you are abſent, nothing can be more welcome, than your letters, of which the laſt is dated May 7. On Saturday I ſent you a full repreſentation of our publick affairs. I have not thoſe two German tracts, which young *Clodius* is tranſlating; ſo that I cannot tell the particular themes or contents of them. Only in the general I can inform, that they deſcribe the whole philoſophical work with ſuch rationality and candor, as few other books of the ſame nature can be compared with it. The author, it is certainly known, had the philoſopher's ſtone. Young *Clodius* is returned again into the country. Your engagement for Mr. *Pocock* will be very acceptable to Dr. *Worthington*. I wiſh you would alſo improve the foreſaid learned gentleman's ſkill in Arabick to a more conſiderable uſe. The French gentleman ſhould have been characteriſed alſo by his name. I thought a treatiſe of *Des Cartes de Animalibus* had been publiſhed long ago; but Mr. *Oldenburg* ſpeaks of it as a new matter, in theſe words. "I ſuppoſe "you have heard, that there is another vo- "lume of *Des Cartes*'s letters under the "preſs, which will be ſhortly finiſhed; and "after that, a treatiſe of the ſame author *De* "*Animalibus*, wherein he endeavours more "particularly to prove, than in his other "writings, that all their actions are merely "mechanical. They are advanced by an "admirer of his, called monſieur *Cherſelier*, "who is here at *Paris*, and of our acquaint- "ance, by whom we ſaw the other day *Des* "*Cartes*'s own hand concerning that ſubject, "and amongſt other particulars, a compari- "ſon of his between the operations of the "body of animals, and the harmony of or- "gans; affirming, that as the ſaid harmony "depends from three things, *viz.* the air, "that comes from the bellows; the pipes, "that give the ſound; and the diſtribution "of that air into theſe pipes; that juſt ſo "the functions of an animal; that is to ſay, "the motions of its members depend only "from the animal ſpirits proceeding from "the heart, that are like to the air coming "from the bellows. 2. From the pores of "the brain, through which thoſe ſpirits paſs; "and the nerves and muſcles, into which "they paſs, reſembling the pipes, that give "the ſound. And, 3. From the manner in "which they are diſtributed into them; in- "ſomuch, that as our church-organs, *&c.* "are thus diſpoſed, that from the agitation "and diſtribution of the wind into the pipes, "there follows neceſſarily a ſound and har- "mony, which we hear; even ſo an animal "is compoſed, that whereas the animal ſpi- "rits are preſſed into the cavities of the "brain, and thence conveyed through the "nerves into the muſcles, there muſt of ne- "ceſſity follow thoſe motions in the mem- "bers, which we ſee." Thus far he; the letter being dated April laſt. But it ſeems, that that *De Homine* will be a treatiſe apart. I wonder, that Mr. *Oldenburg* hath not written concerning the weekly learned aſſembly at *Paris*. My books from *Holland* are at laſt arrived. I humbly deſire to know, whether I ſhould keep them here till you come up to *London*; or whether you will have them ſent to *Oxford*. Yeſterday I had a letter from Mr. *Beale*, beginning with theſe words. "And becauſe you are ſo tender of my "health, I muſt give you account, that the "flux and bloodineſs of mine * * * *

May 17, 1659.

Honoured SIR,

MY laſt was on Saturday, preſenting the continuation of our publick affairs. Since I received your laſt of May 14. I humbly thank you, for naming the gentleman of the French club. The reſt of your letter I ſhall certify alſo to Mr. *Oldenburg*. The names of the books lately come over are, *Lucerna Salis Philoſophorum. Hoc eſt, Delineatio nuda deſiderati illius principii. Tertii Mineralium Sendivegiani, in* 8 *pag.* 167. II. *Ejuſdem Authoris Tr. Germanicus de Principio Tertio Mineralium, ſive Sale Philoſophico, in* 8*vo, pag.* 44. III. *Joh. Iſaaci Hollandi Opus Vegetabile*. All in high Dutch, in 8vo, pag. 144. by which you may ſee, that it is but a little piece of *Hollandus*'s greater work. IV. *Novum Lumen Chemicum, ſive Medicum Polmanni*, in ſmall 8vo, all in high Dutch, of a very fine and ſmall character, pag. 82. opening the myſtery of the *Sulphura Philoſophor*. My ſon hath read it, and commends it as a moſt excellent piece for advancement and amendment of all medicinal knowledge: he counts alſo the whole treatiſe moſt worthy to be tranſlated. There is alſo ſent unto me another book, which I did not write for, being all the *Opera Paracelſi* in Latin folio in one volume, with his *Opus Chirurgicum*, which was never extant in Latin before, and yet his maſterpiece. The price unbound is thirty-three ſhillings, or one pound thirteen ſhillings; whereas, in *Paul*'s *Church-yard*, I am told it is rated at one pound fifteen ſhillings. I pray let me know your mind, if you will have that alſo. The other two treatiſes, tranſlating by *Clodius*, though they profeſſed-

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ly treat of the philoſopher's ſtone, yet it ſeems they have divers collateral good things, as an inſtance has been given unto me in the culture of vines. The continuation of the papers concerning artificial hatching is very welcome. I have lately obliged Mr. *Oldenburg*'s gentleman in *Languedoc*; ſo that he hath obtained from him that precious and wonderful oil, which he lighted upon in ſearching after *Butler*'s ſtone. And Mr. *Oldenburg* having imparted this ſecret in his laſt, I cannot but confide the ſame unto you by way of recital, the recipe of it being as followeth.

RECIPE.

Oleum melioris notæ. Hoc diſtilla eo quo decet modo magnus V. Helmont. Diſtillati ☉ calcina ut ibidem dictum. Calcinatum miſce cum ana ☽ & ♎ bis aut ter. Habebis ♎ rubicundiſſimum in frigido ſolubile in oleum pretioſum, cujus aliquot guttulæ aliquamdiu cum oleo communi maceratæ, illud colore rubicundiſſimo tingunt. Quod hoc modo debite præparatum eadem, quæ multoties expertus ſum, & vobis narravi, effecta præſtabit, ſi Deo omnis boni largitori placuerit.

" Theſe effects, as he told us, were the " virtues of curing head-aches, palſies, and " all ricketing diſeaſes." Thus far Mr. *Oldenburg*, forbidding the communication of it to my chemical ſon, except he will gratify the ſaid gentleman with a copy of the Helmontian manuſcript, which he hath in his poſſeſſion. Mr. *Oldenburg* adds: " The ſame " Languedocian gentleman hath ſent me the " title and abridgment of a ſtrange book, " found out ſome years ago in *Provence*, " which I may communicate alſo to your ſon " in law, according as I find his anſwer to " my former deſires. To give him a taſte " of it, I ſhall ſay only thus much at preſent, " that it is called, *Hebdomas Hebdomadum*, " *Cabaliſtarum, Magorum, Brachmannarum, an-* " *tiquorumque omnia Sapientum Myſteria conti-* " *nens.*" Thus far Mr. *Oldenburg*. As ſoon as I hear any thing again from Dr. *Horne*, you ſhall be ſure to know it. I wrote largely, and ſent ſome conſiderable preſents unto him, of books and manuſcripts, to oblige him the more to the performance of his promiſes concerning ſalts, and ſome other uſeful experiments. Here I ſend you Mr. *Auſtin*'s anſwer, to requite your kindneſs of having put you to the trouble to impart that extract unto him out of Mr. *Beale*'s letter, concerning raiſin wine. Mr. *Brereton* is extremely melancholy and ſad, not only in reſpect of his private, but much more of the publick affairs; but the particulars are of that nature, that they muſt not be written, but referred to your meeting. Here you have the liſt of the members of the council of ſtate, which is likely to ſit in the lords houſe: for yeſterday the parliament hath voted the ſelling of *White-hall*, *Somerſet-houſe*, *Hampton-court*, and *Greenwich*. They talk of a petition to be brought in againſt lords *Fleetwood* and *Diſbrowe*, and a dictatorian power to be ſettled in the army. I cannot learn the certainty of a new report, ſpread with great confidence, of my lord deputy of *Ireland* taking the field for the defence of his late highneſs: he is willing, they ſay, to allow of the diſſolution of parliament, but by no means of diſſolving the protectorate. In a word, there is a general conſternation over the hearts of men amongſt us; the like, I confeſs, I have never obſerved. I muſt needs very heartily acknowledge your now coming favour, which, inſtead of making uſe of for other good purpoſes, I am conſtrained to ſupply my own neceſſities, into which I am alſo reduced by the preſent change, my penſions of two hundred pounds a year being founded upon his highneſs's and council's orders, and privy ſeals, now utterly made null. Laſt our lady-day I ſhould have received ſeventy-five pounds out of the exchequer; but it being delayed till this change of government, there is no hope to get one penny of it. I reſt ever,

Honoured Sir,

your moſt faithfully, and

thankfully devoted,

S. HARTLIB.

P. S. The bad news out of *Ireland* is too true. My ſon *Clodius* ſpoke with one, that came from thence eight days ago. I have entreated him to give his relation by this poſt.

Thurſday May 19.

THIS day the parliament paſt an act for conſtituting *John Sadler*, *John Sparrow*, and *Samuel Moyer*, judges for probate of wills. They alſo referred to a committee to conſider, how the proving of wills may be diſtributed into the ſeveral counties of *England*, and of what was formerly done upon the bill for regiſters in the ſeveral counties. They alſo paſt an act for conſtituting *John Godolphin*, and *Charles Georges Cock*, Eſqs; judges of the admiralty. They referred it to a committee to inform themſelves of the yearly value of the regiſter's office for probate of wills; and what part of it will be fit to be reſerved for the uſe of the commonwealth. They referred it to the ſaid committee, to take conſideration of all other offices, that are or ſhall be in the diſpoſal of the ſtate; to the end it may be reſolved, what will be fit to be allowed the officers, and the reſt to be applied to the publick ſervice; and to conſider of any claims as ſhall be made to any ſuch offices, and to offer their opinion to the houſe, what will be fit to be done therein. They referred it to the council of ſtate, to conſider how far this nation is, or is like to be, engaged in war or peace, with other nations; and to prevent this nation being engaged in war, without conſent of parliament. They referred it to a committee, to bring in a bill for repealing the act to *H. Scobell*, Eſq; for being clerk of the parliament; and for conſtituting the ſaid office upon Mr. *St. Nicholas*. They

They paſt the act and inſtructions for a council of ſtate, who are like to ſit to morrow at *White-hall*. Upon a petition of the inhabitants of the bay of *South-hold* in *Suffolk*, where by a ſudden fire two hundred thirty-eight manſion houſes were ſuddenly burnt, they ordered the ſpeaker to ſign divers patents, for collecting the charity of the people throughout all *England*, towards their great loſs.

Honoured SIR,

ON Thurſday I communicated largely our publick affairs. Yeſterday I had a letter from Mr. *Wood*, in theſe words. "Your "recipe for the curing the preſent plague in "horſes has proved very effectual, as well in "my lord's ſtable, as elſewhere; divers of "our horſes, that took it, have been cured; "and, indeed, all of them, to which it hath "been carefully applied; and though ſome "of them have relapſed, yet the ſame means "has reſtored them; and the recovered hor-"ſes are now moſt of them at ſoil with clo-"ver-graſs; two acres of which we have "hired this ſummer, from May to Michael-"mas, at ten pound rent, and that in *Ireland* "too, which I mention, that you may ſee it "is profitable ſomewhere, notwithſtanding "the diſcouragement your friend mentions "he received. God, in his mercy, grant a "good iſſue to the preſent revolutions in "*England*. I hope we ſhall continue quiet "here. Dr. *Petty* is newly landed, but I "have not ſeen him yet. This evening my "lord of *Corke* came to town, and brings "news, that my lord *Broghill* arrived ſafe at "*Waterford*, yeſterday morning. Pray let "my lady *Ranelagh* know this." Thus far Mr. *Wood*, the letter being dated May 11. Mr. ſecretary came two days ago to the committee of ſafety, intimating, that though he was laid by, and ſeveral affronts put upon him, yet, that he was reſolved to ſerve the commonwealth with all faithfulneſs; and therefore came to give them certain intelligence, which he had received, that forty Holland men of war were upon our Engliſh coaſts, plying to and fro, and that had *Charles Stuart* amongſt them, who happily with his men might be landed in *Ireland*. They ſay, he was not much thanked for it, being told, that they had their own intelligence, and needed none of his informations. Lord *Fleetwood* profeſſed lately, that he was in ſuch ſtraits, that he could not tell which way to turn himſelf. The ſeveral differences are not yet compoſed; and the agitators, with the common ſoldiers, are worſt of all. Thurſday night were obſerved ſome affrighting ſigns in the air, about ten a clock at night a blazing ſtar, with a great tail in the form of a rod, and afterwards of a ſword, appearing over *White-hall*, and towards *Weſtminſter*. I can ſay no more, but reſt ever,

Honoured Sir,

your moſt ready and faithful,

May 21, 1659. *Manus Nota.*

May 31, 59.

Honoured SIR,

ON Saturday laſt I ſignified the arrival (amongſt other particulars) of Mr. *Worſley*. Your laſt is dated May 28. Ludus Helmontii is not yet prepared, though my torments need a remedy more than ever. I believe you could prepare as good an oil, as that of the Languedocian gentleman ſeems to be. Your new teleſcope will be extremely welcome to Mr. *Worſley*. When you return to *London*, I hope you will not leave it at *Oxford*. I had large letters of late from worthy Mr. *Beale*, but they are on an argument concerning the reformation of Engliſh laws and lawyers, wherein your excellent ſifter deſired his beſt aſſiſtance. The balſam of ſulphur I had from my phyſical ſon, who aſſured me, that though it was not the beſt, which he could make, yet is was very good. He is of your opinion, that the ſpirit of man's blood, and the ſpirit of hartſhorn, are a far more powerful and effectual medicine for an aſthmatical cough, than the foreſaid balſam. We long to ſee you at *London*, that you may be alſo more freely acquainted with our publick affairs, which muſt not be committed to paper. I ſuppoſe you will hear from ſome other hands, that the earl of *Warwick* is departed this world. Since my laſt, the houſe hath been reſolved into a grand committee; ſo that they are not yet come to any votes in parliament. Reſident *Bradſhaw* (for ſo he was for ſome time in that quality at *Hamburgh*) is to go within a day or two to the *Sound in viam* with new inſtructions; ſo that I apprehend Sir *Philip Meadows*, our reſident there, is, or will be, called home. The like courſe, it may be, will be taken with Mr. *Downing*, our reſident at the *Hague*, where *Holland*, *France* and *England* are now fully agreed about the articles, according to which the two Northern kings might make their peace. There is a ſyndicus arrived from the city of *Lubeck*, to preſent to this commonwealth the conveniency of that place, and that they are willing to allow of a ſociety or corporation of Engliſh merchants, to improve the trade of *England*, if they will accept of it. There are alſo great overtures on foot, to make a firm alliance between *England*, *Holland*, and *Sweden*, which would certainly be a threefold cord, that could not eaſily be broken. There is a vote paſſed, that the late protector ſhall not diſpoſe of the deer in *James*'s park. The new fleet, which is ſuddenly to be ſet out, is to conſiſt of threeſcore men of war. The fear of an univerſal inſurrection is no more ſo great, as it was ſome days ago. The remaining heads or articles of the army's petition are ſtill under debate. This day a letter was read from general *Monck*, wherein he informs of *Charles Stuart* being lately at the *Hague*, and of the deſigns, which are apprehended to be contriving to diſturb the peace of the nation of *Scotland*; which letter was referred to the council of ſtate. Upon report made from the council

council of ſtate, the houſe took up the conſideration of the intereſt of this commonwealth, in reference to the ſame, and have reſolved, that there be appointed plenipotentiaries by the ſtate, for obtaining a good peace between the two Northern kings, and to adjuſt and ſecure the intereſt of this commonwealth and its allies in the *Sound*, and, with the aſſiſtance of the fleet of this commonwealth and other fleets of its allies, to endeavour the ſame. They reſolved, that the perſons to be appointed ſhould be five, who, or any three of them, ſhould be impowered to tranſact in this affair, and to act by ſuch inſtructions, as the council of ſtate ſhould give. The names of the ſaid commiſſioners are firſt to be approved by the parliament. The reſt is in the adjoined paper. Lilium convallium is ſaid to augment very much the natural fragrancy of rheniſh wine. Whole barrels full are fetched by the *Dutch* from *Norway*, being dried. For the wine-merchants there, by putting ſtore of this lilium convallium into French wines, they turn them into Rheniſh wine. I pray tell, in your next, where lilium convallium is growing moſt plentifully in *England*. I cannot learn but that it is very ſcarce. I reſt ever,

Honoured Sir,

your moſt readily devoted

SAM. HARTLIB.

Octob. 22, 59.

Honoured SIR,

MY laſt was dated Octob. 18, wherein I gave you thanks for tranſmitting *Bill*'s anatomical papers: ſince I received a box from the carrier, with the ludus humanus without any letter. Nor have I received any line from your hands, in anſwer to my three former letters. Theſe are to preſent unto you my moſt humble thanks for the foreſaid ludus, which I ſhall urge my ſon to make out of hand. This week Mr. *Jones* hath ſaluted me with a very kind letter, containing a very ſingular obſervation, in theſe words. "Concerning the generation of pearls, I am of "opinion, that they are engendered in the "cockel-fiſhes (I pray, Sir, give me the "Latin word of it in your next) of the ſame "manner as the ſtone in our body, which I "endeavour fully to ſhew, in a diſcourſe of "mine, about the generation of pearls; which, "when I ſhall have done it, ſhall wait upon "you for my part in revenge of your obſervations. I heard lately a very remarkable "ſtory, about margarites, from a perſon of "quality and honour in this town, which "you will be glad, I believe, to hear. A "certain German baron of about twenty four "years old, being in priſon here at *Paris*, in "the ſame chamber with a Frenchman (who "told this, as having been eye-witneſs of it, "to him that told it me) they having both "need of money, the baron ſent his man to "a goldſmith, to buy ſeven or eight ordinary pearls, of about twenty-pence a piece, "which he put a diſſolving in a glaſs of vinegar, and being well diſſolved, he took "the paſte, and put it together with a powder (which I ſhould be glad to know) into a "golden mould, which he had in his pocket, and "ſo put it a warming for ſome time upon the "fire; after which, opening the mould, they "found a very great and lovely oriental pearl "in it, which they ſold for about two hundred crowns, although it was a great deal "more worth. The ſame baron throwing a "little powder he had with him into a "pitcher of water, and letting it ſtand about "four hours, made the beſt wine, that a man "can drink." Thus far the truly hopeful young gentleman, whereby he hath hugely obliged me. I wiſh he had the forementioned powder, that we might try, whether we could make the like pearls and wine. The great ſociety, which is ſaid to have far greater matters, is like to break forth next week. For this week the concluſion was, *cum fine hujus ſeptimanæ finis erit miſeriarum veſtrarum*. As ſoon as their declaration is out, I ſhall not fail to ſend you a copy, with what elſe I may. In the mean while, I humbly beg your ſilence concerning the forementioned concluſion. Mr. *Woodnot*, my ſtationer, hath the anatomical papers, with Mr. *Pell*'s deſired explanation; for I know he will get it as cheap as any ſtationer, with whom you are acquainted. You will let me know how many copies ſhall be ſent unto you, with your other promiſed directions for the diſtributions of them. Nothing is ſince my laſt paſſed in the publick affairs of any extraordinary conſequence. *Monck*'s letter to the parliament is now in print, wherein he declares againſt the petition and propoſals of the army; but colonel *Cobbet* is diſpatched with new inſtructions into *Scotland*, and colonel *Barrow* to *Ireland*, to inform them what is paſſed between the parliament and army, with the reaſons of their proceedings. The council of ſtate have in a manner diſſolved themſelves of their own accord, ſome adhering to the parliament, ſome to the army, of which number are Sir *H. Vane*, major *Salaway*, Sir *J. Harrington*, lord *Wareſton*, colonel *Sydenham*, lord *Whitelocke*. Sir *A. Haſlerig* is going into the country, if he be not gone already. On Wedneſday the general council of officers held a faſt in *Whitehall* chappel. Lord *Fleetwood* is declared and owned commander in chief over all the land forces; *Lambert*, major general of the forces in *England* and *Scotland*; *Diſbrowe*, commiſſary general of the horſe; lieutenant general *Ludlow* is made one of the committee to nominate all ſuch perſons, who hereafter ſhall be admitted officers of the army. Lord *Bradſhaw* is fallen ſo ill, that they begin to deſpair of his life. Some of the ſemi-council of ſtate, and of the general council of officers, were ſent to offer the keeping of the great ſeal of *England* to Mr. Speaker; but he would not accept of it. Both the foreſaid councils

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are daily conſulting about the drawing up a declaration to the three nations, and what government to introduce and ſettle; but nothing as yet concluded. Yeſterday an expreſs was diſpatched into the *Sound*. Mr. *Worſley* never comes at me, yet I heard he confeſſed to lord *Frieſendorf*, that if the parliament had ſat four days longer, his head would have gone off. Lord *Lambert* received a letter with high promiſes from *C. S.* but he ſhewed it to Sir *H. Vane*, and others of the council. I can hold out ſcarce any longer, but ſubſcribe myſelf,

Honoured Sir,

your ever faithfully devoted

S. HARTLIB.

P. S. THERE is a council of ſtate conſtituted, conſiſting of twenty three perſons, of whom I have named ſome already; the reſt are, *Hewſon*, *Steele*, *Tichbourne*, *Ireton*, the late preſident *Lawrence*. The reſt I cannot call to mind. Theſe are to make up the government for the preſent. Commiſſioner *Liſle*, lord *Whitelocke*, and one more, are the keepers of the great ſeal of *England*.

Nov. 1, 59.

Honoured SIR,

I HAVE ſent by a Bohemian divine, that hath been commended to *Oxford* by Mr. *Comenius*, and lived lately as chaplain with Mr. *Thurloe* (his name is *Paulus Hartmannus*) the deſired twenty five copies of *Bill*'s *Anatomy*, together with the army's declaration. If I do not ſend the account at this time, it ſhall be incloſed in my next, under Mr. *Woodnott* the ſtationer's own hand. By him I have ſent the forty copies to Dr. *Cox* (for you need not queſtion, but they will be acceptable) in your name. And I am diſtributing to the reſt of the gentlemen, whom you have named, as faſt as I can meet with them. I mean alſo to ſend one to monſieur *Bill* himſelf, to let him know, what honour hath been done unto him by a young nobleman in theſe parts; and many more to friends in the *Low Countries*. Really you have done an excellent work, for ſpreading this anatomical magnale upon the honeſt learned world. I have received no letters from you ſince the 24th of October, which ſomewhat troubles me, becauſe I cannot tell, whether any of my letters, which have been ſent theſe two weeks, have come to your hands. I ſhould be very much troubled, if they are miſcarried. Amongſt other particulars, I wrote ſomething concerning the ſecret ſociety ſuddenly to break forth. I ſuppoſe I ſhall ſhortly be acquainted with ſome of the members; nor ſhall I ſhrink to propoſe unto them that ſame, which monſieur *Bill* doth require for carrying on of that noble work. For if all be true what I hear, though it ſeem great, yet is but a trifle to them. And truly if I had any ſuch ſtock, I ſhould ſuffer no body to ſhare with me in the glory of that publick charity. The very laſt poſt I received the following lines. "Monſieur *Bill* lives at "preſent at *Rotterdam* in the Engliſh Court "(ſo is the name of the houſe, where he "lives in *Rotterdam*.) He is a Frenchman; "ſpeaks French, Low-Dutch, and Latin. "He hath four bodies, two men and two "women, ſo anatomiſed, that he can ſhew "the inward ſtate of a man's body. For all "the parts of the body are in the body, ex"cept the guts and brains, which lye by. "He aſketh above 100000 Dutch guilders, "and then he will teach the anatomy out of "them to ſcholars, ſurgeons, *&c.* He ſaith, "this coſt him not only infinite pains and "head-breakings, but that, of his own patri"mony, he ſpent to this work 60000 guilders. "He affirms, that *Paris* hath preſented him "about 20000 francs, and *Amſterdam* about "3000 francs, for 2 corpora; but he will "not ſell them apart, but in that manner as "I mentioned. It ſeems it is very rare, that "he anatomiſed, in ſuch a manner, thoſe "bodies, and prepared alſo, that they can be "clearly ſeen, every thing in his proper "place. The like is yet never done in this "world!" The letter is dated October 31. From another confiding friend, Mr. *Dury* was lately acquanted after this manner. *Ecce afferuntur generoſo domino de Geere Conſtantinopoli literæ a domino Warnero, quem ille ante triennium jam & prece atque pretio requiſiverat, vellet; tranſlationem biblici codicis in linguam Turcicam ſibi cordi curæque eſſe. Dictum factum. Bonus ille & domui de Geerianæ ob promota pridem juventutis ſuæ ſtudia obſtrictus atque deditiſſimus, laborem iſtum hujus commendatione, & lauti ſubſidii ſubminiſtratione, alacriter ſuſcepit, atque quod jam ſcribit, eouſque promovit & peregit, ut pauca reſtent, quin brevi diem univerſa biblia lingua Turcica loqui conſtet. Promittit enim exemplar MS. ad typos promovendum intra ſemeſtre hoc circiter ſe poſſe & velle, huc ad gen. dominum de Geere curare.* This is as welcome and refreſhing, as that of *Bill*'s, ſave that he hath no *de Geere* appearing for him. Mr. *Beale* returns his thanks in theſe words. "I have taſted of Seraphic Love. It "is like a deep river, carrying more ſtrength "than noiſe. The Jeſuit *Euſebius* of *Nurem*"*burg de Ingenio Amoris* hath broken the "myſtery of divine love into fragments of "ſhort wit; as if one would cut hair ſhort, "to make it ſtrong." Thus far he. I am mightily perplexed for the preſent, being likely to loſe, by carrier, a manuſcript of above twenty ſheets of his *De Re Hortulana*. Mr. *Oldenburg* begs moſt earneſtly to be gratified, acording to his deſires, in the incloſed paper. If you would vouchſafe alſo to ſend it to Mr. *Auſten*, to know his anſwer upon it, the kindneſs would be very obliging to us both. Lord *Bradſhaw* died yeſterday in the afternoon, having left behind him lands worth ſix thouſand pounds, beſides a great perſonal eſtate. *Monck* is ſaid to be on his march. Our forces are to march alſo, having received two months pay. *Monck* doth declare not for a free parliament, but for this laſt diſſolved. And it is confidently reported by ſome, that

the old diſſolved parliament, within a very few days will ſit again. The hearts of men are filled with ſadneſs and apprehenſions of all manner of confuſions, more than ever. Thus, earneſtly longing for your letters, I reſt,

SIR,

your trueſt votary,

SAM. HARTLIB.

Nov. 15, 1659.

Honoured SIR,

LAST Saturday I ſent a very bulky packet coming from *Ireland*, with a copy of *Dalgarno*'s letter, and a few lines of my cure. Yeſterday I received again one of your deſirable letters without any date, but ſuppoſe to be written on Saturday laſt. For that trick again I ſhall ſend no more packets by friends; for ſo they have ſerved me for the moſt part upon the like occaſions. Mr. *Pell* deſired to have the correcting of the print, as thinking himſelf far more nice and critical than your humble ſervant. He had it, but it ſeems the porter did not find him at home, when he brought to him the firſt ſheet, nor could I ſpeak with him, till the ſecond ſheet alſo was printed off. I can aſſure you, the written copy was no other than that, which is printed, but I was forgetful to ſend back thoſe lines, it only concerning myſelf (who in truth is nothing elſe but a lump of worſer faults) and being greedy to have it printed off with all expedition. I have received letters lately out of *New England*, whither I purpoſe, God willing, to ſend a packet of ten or twenty copies, and as many to *Jamaica*, to my ſpecial good friend there Dr. *Browne*, that from both thoſe places they may diſperſe them to other Engliſh plantations. I humbly beg to enlarge or explain yours in what particulars you apprehend the *Madagaſcar* way or practice may be made more uſe of, than the natives are aware of. If you anſwer, I ſhall add it to the heap of your other obligations. The queries, which you farther make about the Turkiſh bible, I cannot reſolve, but ſhall write, God willing, to have them anſwered by monſieur *de Geere* himſelf. As I did laſt week let him know, what aſpect was caſt from yours and *Oxford* towards him, and ſuch kind of endeavours; and how far you were advanced towards the ſame deſign. I ſhall alſo enquire of Mr. *Hottenger* about a catechiſm, but do not put Mr. *Pocock* upon any ſuch tranſlation, till I ſhall have imparted unto you ſome few lines about the method of propagating or inſinuating of religion by catechiſms. Mr. *Pell* tells me, that *Warnerus* is a moſt accompliſhed man, and that for his great abilities and ſkill in Arabick and other oriental languages, he was counted worthy to be ſent to be reſident for the States at the Ottoman court. He added withall, that many years ago *Warnerus* had publiſhed his Collectanea of all the paſſages concerning Chriſt out of the Alcoran. I have written for it to *Warnerus*'s friends laſt Friday; for I know it will mightily pleaſe our Herefordian friend. Mr. *Oldenburg* ſays, that more experiments de vacuo are greatly longed for by your French philoſophers. Yeſterday I received the ſum of 5 *l.* by your appointment. The title of Mr. *Beale*'s manuſcript is called, *A free diſcovery of the true, lawful, holy, and divine expedient for the propagation of the goſpel, and eſtabliſhment of an univerſal peace all over the world.* It is above twenty ſix ſheets, beſides many other ſheets formerly written on the ſame argument, which I am to add, whenſoever it is printed, and then it will come to I know not how many more; ſo that I fear it will be too big and hazardous for your undertaking in theſe unſettled times. Mr. *Brereton* was ſtark wild after it, having read but a few pages. He does not legally own it, becauſe of the many paradoxes, or rather free truths in it, as I do judge them. But writing to him how providentially he had met with the ſaid manuſcript (for he meeting with the carrier, ſeeing ſo great a bulk, and knowing Mr. *B.*'s hand, paid the carrier, and returned with it to my ſtudy,) and how I was conſtrained to open the packet in his preſence, liking it ſo highly, obtained leave to tranſcribe a copy. The truth is, I deſign all ſuch and the like works or tracts be printed upon the charges of *Macaria*, whoſe ſcope it is moſt profeſſedly to propagate religion, and to endeavour the reformation of the whole world. But it is ſcarce one day (or hour in the day) or night being brim full with all manner of objects of that publick and moſt univerſal nature, but my ſoul is crying out,

Phoſphore! redde diem, quid gaudia noſtra moraris? Phoſphore, redde diem!

Perhaps within a few days longer I may for an interim preſent your goodneſs another ſubject of worth and uſefulneſs, upon which you may ſpend that ſum, which now you have depoſited in my hands; and by doing ſo you relieve in the mean while very great extremities. For yet I am overwhelmed with all manner of ſmaller and greater debts or engagements. Nor dare I for the preſent diſrobe myſelf of all the occaſions and advantages I have of continuing in my ways of well doing. For this would be—*Devorato bove in cauda deficere*; yet a little while, and deliverance will come. I told Mr. *B.* out of your former, that you were too much an orator. He anſwers—*De re Chriſtiana optime meruit eruditiſſimus Pococius, quod argumenta Grotiana Arabice reddidit recte: ait Bovillus (Boylius) noſter preclariſſimus, ſatis eſſe, ſi Chriſtiani ex vero ſimus. Nil opus alio charactere, neque nomenclatoris additamento. Verum quid ille me oratorem nominabat! Mallem virum bonum, bonum, agricolam, colonum bonum Catonis aut Varronis ſuffragio. Nemo niſi vir bonus poteſt eſſe orator, ut ait Cicero, ipſe oratorum princeps. Ego, ſi eſſem orator, non tam ingrato forem animo, ut in redhibitione tum diu obmuteſcerim. Illud inſuper addo, ecquem novimus oratorem evadere, qui in pulvere ſcholaſtico integram juventu-*

tem diſperdere neceſſe habuit, quod mihi miſero fatis importunis obvenit. Obſecro meo nomine ſummo viro plurimam ſalutem impertire non dedigeris, et in operibus Dei reſerandis bono publico et poſteris operam tam ſero navantem auſpiciis divinis proſequamur. That which follows written by the ſame good hand is no ways ſo pleaſing. " That you miſtake not, the hor-
" tulan paradoxes were ſent above ſix weeks
" ago, and I conclude they are loſt from us.
" That of tranſmutation of flowers is ſurely
" in the warehouſe at *London*. If it ſhould
" be loſt, it is not in my power to repeat it
" or to recover it; for it is the firſt draught,
" and as ſoon as I have engroſſed, I am wont
" to diſcharge my memory. And my me-
" mory holds me to that covenant of immu-
" nity; and as the beaſt will not feed on
" blown fodder, ſo doth my ſpirit love freſh
" air and free perambulations. *Nempe ut*

" *Avia Pieridum peragrem loca, nullius ante*
" *Trita ſolo, juvat integros accidere fontes.*"

The letter is dated Nov. 24. The packet to my great grief is not found in the *London* warehouſe. I have begged ſearch to be made at *Hereford*. I have called upon *Clodius* to write to you, and to ſend you the deſired Dutch books. As I am called upon to pay for them, which as yet my ſon hath not done to me, it encreaſes my preſent burdens. I ſuppoſe you have heard, that *Canaparius de Atramentis* is lately reprinted at *London*. Worthy Mr. *Pocock* will not willingly hear of the death of Mr. *Gouland*, once library-keeper of the biſhop of *Lincoln*'s library at *Weſtminſter*. Lord *Bradſhaw* left no laſt will at all. Yeſterday came forth a very notable diſcourſe called the lord general *Fleetwood*'s anſwer to the humble repreſentation of colonel *Morley* and ſome other late officers of the army, wherein he declares his judgment and conſcience, what is the good old cauſe, and for a free parliament as the only expedient for *England*'s ſettlement. Sir *H. V.* is ſaid to ſeparate himſelf from the councils of *Wallingford* houſe, profeſſing his reſolvedneſs to retire to his country-houſe. The commiſſioners have agreed to lay by the old parliament, and that the armies ſhall proceed no further. I reſt, *&c. &c.*

Nov. 26, 1659.

Honoured SIR,

I HOPE you have received my letter on Tueſday by the Daniſh maſter of arts *Petreus*. You may pleaſe to impart unto Mr. *Pocock* and to him the following lines. " I
" had yeſterday a letter out of *Germany* from
" monſieur *Ludolf*, governor of the young
" princes of *Gothe*, whom I find very ſtudious
" and ſkilful in the Æthiopian tongue and
" religion. He hath begun a new Æthio-
" pian dictionary, which he communicateth
" to monſieur *Bochart*, the great miniſter at
" *Caen*, who came to ſee us here in his paſ-
" ſage to the national ſynod at *London*. Be-
" ſides the ſaid dictionary, he is publiſhing a
" new deſcription of *Æthiopia*, aſſuring, that
" what *Alvarez* and others have done there-
" about, are very imperfect pieces, leaving
" the moſt important things behind; and
" not having well known that tongue, which
" this *Ludolf* underſtands to perfection. He
" giveth me notice alſo, that at *Helmſtad* is
" printing *deſcriptio Malthæſi novæ, et antiquæ*,
" by the governor of the baron *de Blumethal*,
" ſon of a miniſter of ſtate to the elector of
" *Brandenburgh*. As alſo that one Dr. *Lutke-*
" *man* hath publiſhed two treatiſes, one *de mun-*
" *do intelligibili*, the other *de Paradiſo primi ho-*
" *minis habitaculo primo*." Thus far Mr. *Oldenburg*, Nov. 29. he adds, " *Bill*'s *Narrative*
" I am putting into French for to communi-
" cate it to your meeting at Mr. *Monmor*'s. I
" hear, that the anatomiſts at *Padua* have uſed
" an invention, whereby they have made a
" certain liquor to eat all what lyeth about the
" inner parts of man's body, and ſo have
" cleared the way to make an exact inſpection
" of all what may be conſiderable. But I
" doubt not this ſkill of *Bill*'s ſurpaſſeth all
" what hath been hitherto found out for ana-
" tomical knowledge. Our French aſtrono-
" mers have not yet given their judgment
" upon *Huygens*'s *Syſtema Saturni*. *Warnerus*
" hath been my condiſcipulus at *Bremen*, found
" always a very honeſt and ſtudious man, and
" a ſingular lover of the oriental tongues.
" As to the tranſlation of *Grotius*, I could wiſh,
" that the able tranſlator thereof would pleaſe
" to add here and there as much perſpicuity
" and force as is poſſible; for I think the rea-
" ſons of that author may receive an addition
" in both reſpects. From *Caſtres* one writeth
" me word, that there is a book printed in
" Engliſh, *de arte volandi*; and that an Engliſh
" gentlewoman living here at *Paris* called
" Mrs. *Verger* hath it in her cabinet, being
" a curious and learned woman, which will oc-
" caſion us to wait on her as ſoon as we can;
" and ſhall in the mean time beg your favour
" of enquiring after the ſaid book, if you
" do not know it already. Though I have
" lately written at large to our noble philo-
" ſopher at *Oxford*, yet am I in doubt, whe-
" ther I have given him thanks for what he
" hath been pleaſed to procure for a friend of
" mine here out of the Bodleian library. Hav-
" ing delivered the ſame here, the perſon
" wondreth much, that *Pizibran de profeſſione*
" *fidei catholicæ et errorum revocatione*, printed
" *Moguntiæ* 1449. ſhould not be in the ſame
" library, whereas he aſſureth me to have found
" it in the catalogue thereof; as alſo the *ora-*
" *tio funebris Caroli Aretini habita à Loenhardo*
" *Aretino*. Wherefore I muſt entreat you once
" more to requeſt Mr. *Boyle*, that he would
" pleaſe to make Mr. *Stubbs* look once more
" for the ſaid *Pizibran*, as alſo to haſten the
" copy of the ſaid *Oratio funebris*, the pains
" whereof ſhall be fully recompenſed by me,
" God willing." Thus far Mr. *Oldenburg*.
Sir, I received lately, from an ancient friend, a water againſt the ſtone, which he ſent me out of *Norway*, out of his ſingular love. He ſpeaks thus of it. " I found this water,
" which here I ſend you, very efficacious *in*
" *fran-*

" *frangendo calculo renum & veſicæ ſæpe in utro-*
" *que ſexu* both by high and low. *Uſus ejus*
" *talis eſt, ſumenda ſunt 4. vel 5. cochlearia hujus*
" *aquæ manè & totidem veſperi. Inſigne levamen*
" *inde percipiet ægrotus accedente benedictione*
" *divina.*" Really, Sir, I muſt confeſs I have found it ſo, having uſed of the ſaid water near a quart. It is no ways nauſeous, but rather pleaſant. But having ſpent all, I heavily complained to the gentleman, that brought it me, who ſaid, he had no conveniency to make it, confirmed the excellency of it, and was ſo kind as to give me the recipe of it, which here I offer into your hands, wiſhing, that Mr. *Stahl* would make a good quantity for yourſelf and the poor, and to let me alſo be partaker of it. Really, Sir, next to the ludus Helmontii, I have found it the beſt medicine. There is no truſting to *Clodius* for it. And beſides, they demand no leſs than ten ſhillings for a live hare, which is the chief ingredient in it. I underſtand it not ſo perfectly, being in Low-Dutch, as Mr. *Stahl*. Our publick affairs grow worſe and worſe, there being no certain news yet, whether *Monck* will accept of the agreement, or not. Mr. *Oldenburg* concludes his forenamed letter, " This very evening *C. S.* is " expected here, but his deſign kept very ſe- " cret." My ſon is ſtill mighty confident of Dr. *Jones*'s work; and if the froſt had not delayed it, he is confident, they ſhould have had the univerſal medicine within three or four weeks. Thus, entreating you to accept of the adjoined paper (which alſo is a very noble undertaking) I reſt ever,

Honoured Sir,

your truly obliged and

devoted ſervant,

S. HARTLIB.

November 29, 1659.

Honoured SIR,

LAST Saturday I acquainted you with ſeveral matters of ſpecial importance: I beg again your anſwer to ſome particulars, now I am to impart what Mr. *Figulus* writes, in anſwer to your deſires, as followeth. " Con- " cerning Mr. *Warnerus*'s tranſlation of the " Turkiſh bible, we are the next poſt to " write to him upon monſieur *de Geere*'s or- " der, and with his letters joined, to ſend it " over hither as ſoon as he can. And then " monſieur *de Geere* is reſolved to make no " delay to have it printed. As for the other " queſtions the noble Mr. *Boyle* makes, " what the intellectual abilities of this *War-* " *nerus* are to perform ſuch a work, you " may pleaſe to believe ſo much of his ſkill " and experience, as I hear, both from mon- " ſieur *de Geere*, Mr. *Rulice* the miniſter, and " others, that he is a very learned and able " man; and in the Arabick and Turkiſh, as " much verſed and perfect as any may be, " that ever hath learned thoſe tongues. Be- " ſides, *P. Golius*, and many others, who are " able there to judge of the work, he hath " choſen for his cenſors, whereof *Golius* " wrote an ample relation to his brother " profeſſor at *Leyden* now of late. It re- " joiced us much to hear of the like forward " intentions and labour of thoſe gentlemen " in *England*, to ſet out in Arabick the book " of *Grotius*. Verily it may be of much uſe " for thoſe nations, it being ſhort, and very " ſubſtantial. This makes monſieur *de Geere* " to long the more for the copy of the tranſ- " lated bible, to the advantage of the ſame " deſign; which God grant. But of *Warne-* " *rus*'s book, (wherein all the paſſages con- " cerning Chriſt are collected out of the Al- " coran) no body knows: I have aſked them " all. Yet I will enquire amongſt the ſtati- " oners of this town, and, if it be to be had, " I ſhall have it by the next occaſion of ſhip- " ing. The other day I came occaſionally " to one, that makes all kind of letters, a " great artiſt in it, an High-German; and " there I found an Arminian prieſt, with two " other, and learned thus much of them, " that they have brought huge bills of ex- " change, to advance here, in this town, the " printing of their Arminian bible. He, " that makes the letters, ſhewed me all ſorts " of their characters, which he hath made " already; they are very curious, and this " work will likewiſe be advanced with all " ſpeed. Thus we ſee God works on all " ſides towards ſome great change, and for " the call of foreigners into the church. O " that *England* were at concord and union! " they could more help this deſign, than any " nation in the world, by aſſiſting the Swedes, " and ſo to diſſipate the kingdom of dark- " neſs and tyrannical power over conſciences. " And thus the courſe of the Goſpel would " be ſet on a free foot." Thus far one of my honeſt correſpondents. Here you have a true repreſentation in print of the ſtate of the proteſtant churches in Europe. This is as ſad as the other promiſing. *Warnerus*'s book, which Mr. *Figulus* writes is ſcarce extant, Mr. *Pell* has had in his hands many years ago: but becauſe Sir *W. Boſwel* had many copies of them, he would buy none, hoping, that Sir *William* would have beſtowed one of them upon him, which he never did. Having written thus far, I received your laſt of November 26, and am amazed to underſtand, that you had not then received my large one of November 22, which I gave to one *Petreus*, to give him an addreſs unto yourſelf. But I hope your next will bring me better news; as likewiſe of the receipt of that written on Saturday. The adjoined from Mr. *Jones* will give ſome account of *Breſſieux*'s engines, or machines. The lines, which I ſent you formerly, out of Mr. *Oldenburg*'s letter, were theſe. " *Breſſieux* intended to begin his " work, and deſireth to have ſome pieces of " good glaſs, clear and fine, which is known " by this, that if put upon white paper, the

" paper

" paper changeth little or nothing its colour " ſeen thorow it. I believe, if you could " gratify him with this, he would anſwer " your deſires, to ſend you ſome of thoſe " ſpherical glaſſes, ſerving in windows for a " fair proſpect. He hath in a manner ready " ſeven machines, for both hyperbolical and " ſpherical glaſſes; and he carried us, ſince " my laſt, to his lodging, for to ſee them; " where he ſhewed us three machines for " concave hyperbolical, three others for con- " vex hyperbolical, and one more for to " work the ſpherical glaſſes with more ex- " actneſs than hitherto. If ſome pieces of " good glaſs could be ſent to him out of " *England*, to work upon, (ſeeing he com- " plaineth of the difficulty of getting good " ſtuff, and that at *Venice* they degenerate " very much in that art,) it would, I believe, " oblige him to permit us ſometimes to look " on his workmanſhip, which he is very ſhy " to do. Thus I have repeated again, what " I have written formerly. I have told Mr. " *Jones* alſo, that this *Breſſieux* is the very " workman, that did work for *Des Cartes* for " two whole years; and therefore I would ſo " willingly (if it might be) pleaſure him with " the beſt glaſſes, that could be gotten in " *England*." Mr. *Beale* anſwers to my beg- ging thus. " I know, that bright cryſtal " glaſs is glary; and to avoid that glarineſs, " our artificers run into the other extreme; " but I know no workmen, whom I can " commend for your truſt, in a better choice. " I have ſcattered *Bill*'s account in *Here-* " *ford*, *Worceſter*, &c. Whatever I ſhall re- " ceive, or hear more of Sir *K. Digby*, ſhall " be preſently yours. I hear very ſad news " from Mr. *Poleman*; for he begins to de- " ſpair of making his medicine, though he " yet continues to try, what poſſibly he " would, but could not, with all his ſkill " and induſtry, make calx and ſpirit of wine " join together." *Clodius* ſays, it may be the fault lyes in the calx, which is made in the *Low Countries* of muſcles, gathered on the ſea-ſhore. Yourſelf hath told me, that you had made that experiment ſucceſsfully. Theſe therefore are moſt humbly to entreat you, to favour Mr. *Poleman* with your direc- tions which you have obſerved. I hope Sir *Kenelm* hath written truth, and not rhodomon- tados. And I cannot have a more faithful, careful, and otherwiſe more knowing man, than Mr. *Poleman*, who, I am confident, doth love me as his own ſoul. One of the papers I ſent by way of requital to Mr. *Jones*. If he could get that experiment of making one great out of many little pearls, I ſhould count it a lucriferous ſecret. I pray put him alſo upon it, when you write to him next. I have called again upon my phyſical ſon for the Dutch books, and what he owes for them. His anſwer is, it ſhall be done, which I do not believe, I confeſs, till it be done. Dr. *Jones*'s work is going on again, and he is fill- ed afreſh with very great expectations. His ſecret friend tells him, if the account of the particular operations, which he hath given him from time to time, be true, it will cer- tainly yield both the univerſal medicine, and the tincture: if it ſhould fail, I am aſſured from others, that *Macaria* is a real poſſeſſor of both theſe great bleſſings, but will own neither of them profeſſedly. But this only amongſt ourſelves. Lord *Lambert* writes good news, having ſent the agreement to general *Monck*, who ſeemed to receive it joyfully, giving order, that the forces ſhould preſently withdraw, &c. But for the final anſwer, he deſires to take ten days deliberati- on. Men conclude the news muſt be hope- ful, becauſe Sir *H. Vane*, who was fully re- ſolved to go out of town, has altered his re- ſolution, appearing again at *White-hall*. Juſt now my ſon *Clodius* was with me, telling that Mr. *Dury* had ſpoken with him, relating out of your letter to your moſt noble ſiſter, that you hoped within three or four days to be at *London*. The like hopes Mr. *Evelyn* cheriſhes of your coming, who hath lately printed a book *of Education*. The copies are not yet abroad; but I am confident he will preſent you with one of them, no leſs than to him, who is not only in reſpect of books, but in all manner of other obſervances,

Honoured Sir,

your very faithfully devoted

S. HARTLIB.

Letters from Sir *William Petty*.

SIR,

MEN dedicate their books to the patrons of the ſubjects, whereof they write, and I dedicate an uſeful and new invention to you, who (ſcorning the airy vanities, wherewith the greater part of men are as yet delighted) do not only profeſs yourſelf a Mæcenas of ſuch things, but can deſcend (or rather aſcend) to the practice of them yourſelf.

IT is not to tickle your fancy with a fine, curious, or intricate conceit or notion, nor to puzzle you with the ſight of a complexure of almoſt an infinite number of various me- chaniments cunningly ſet together, that I have preſented you this diſcovery; for I have always profeſſed to the whole world, that I feared, that only the meanneſs of the means, whereby I performed this unheard of effect, would make it contemptible.

NEITHER is it, that I think hereby to have given you a preſent of great value (as to yourſelf) for had you paid me but 5*s*. you might (as well as others) within ſome few months have been partaker of the benefit; nor do I believe, that you uſe copying ſo much, as that in thoſe few months of con- cealment, it ſhould be worth you ten ſhillings more; only, if in matters of privacy it may ſave ſome hours of your own time, I ſhall think the world obliged to the invention.

IT is not to give you the means of ingra- tiating yourſelf with other great perſonages by the communication of this rarity unto them, before it come to vulgar hands; for you

you are pleaſed to promiſe upon your honour a deep and abſolute ſilence to all enquiries after it.

NEITHER is it to engage you to be earneſt in ſtirring up men to contribute towards my reward; for I conſider, that your fortune and dignity have placed you above the condition of ſoliciting merchants, ſcriveners, lawyers clerks, and ſuch other your inferiors, from whom I muſt expect my recompence.

LASTLY, I do not reveal this ſecret, becauſe I know not what elſe to do with it, nor (like thoſe, who give away their meat not before it ſtinks) employ it to buy your favour, when it will ſerve for nothing elſe: for now it is, that men begin to put off the apprehenſion of a cheat, and to hear generally of it, and conſequently, that the impoſſibility of raiſing ſome conſiderable benefit by it begins to diſappear.

BUT why then, ſince it is not in your way to do me much good in promoting the deſign of raiſing a reward, do I diſcover unto you the art itſelf, thereby giving you power to do me much more harm? It is only, becauſe I hope hereby to oblige your noble and ingenuous ſpirit ſo much the faſter to continue your love and aſſiſtance to inventions, and other real fruits of learning and arts. For if the world embrace the uſe of this invention, you may, by God's ordinary providence, live to ſee a thing, whereof you have the very maidenhead and patronage, to be of daily and almoſt hourly uſe to moſt men in moſt countries of the whole earth, and that to perpetuity; and conſequently your own name made equally univerſal and known, although bright and glorious by your own better deſerving actions.

AND this is the reaſon, why I both dedicate and intruſt the invention unto you, a mere dedication unto real men (as yourſelf) being little better than a mere and that a begging compliment. There is yet another, why I have entruſted you with it, which is, becauſe I, having concredited unto you all my treaſure of this nature, may hope for ſome of your experiments to be entruſted unto me. For my ſtudy and ends being enquiries into nature, and uſeful arts, and finding how ill my abilities to make experiments anſwer my inclinations thereto, I knew no readier way to become fat in that kind of knowledge, than by being fed with the crumbs, that fall from your table: which happineſs and honour if I may obtain, I ſhall labour to merit them, by the moſt ſerious and hearty endeavours within the power of me,

SIR,

your moſt humble, and
affectionate ſervant,

Lond. June 21, 1648. WILLIAM PETTY.

Dublin, April 15, 1653.

SIR,

BEING not able to write you any ſuch compliments, as may delight you, nor to inform you of any ſuch more real matter, as might profit you, I deſire, that thoſe my deficiencies, together with my uſual rudeneſs, may be taken for the cauſe of this long ſilence. Now, indeed, I am forced to communicate with you, even to keep up the face of the viſible church of philoſophers; for, by Mr. *Worſley*'s going for *England*, and major *Morgan*'s abſence in the North, there is no ſuch thing now left at the head thereof. If there be any other reaſon of theſe lines, beſides this, and to beg my continuance in the number of your affectionate ſervants, it is to diſſuade you from ſome things, which my lord of *Corke*, my lord of *Broghill*, and ſome other of your friends, think prejudicial unto you; one whereof is your continual reading. Here, like a quackſalver, I might tell you, how it weakens the brain, how that weakneſs cauſeth defluxions, and how thoſe defluxions hurt the lungs, and the like. But I had rather tell you, that although you read twelve hours per diem, or more, that you ſhall really profit by no more of what you read, than by what you remember; nor by what you remember, but by ſo much as you underſtand and digeſt; nor by that, but by ſo much as is new unto you, and pertinently ſet down. But in twelve hours, how little (according to theſe rules) can you, who know ſo much already, advantage yourſelf by this laborious way? How little of true hiſtory do our books contain? How ſhy is every man to publiſh any thing, either rare or uſeful? How few opinions do they deliver rationally deduced, but from their own principles? And laſtly, How few do begin their tedious ſyſtems from principles poſſible, intelligible, and eaſy to be admitted?

On the other ſide, what a ſtock of experience have you already in moſt things? What a faculty have you, of making every thing you ſee an argument of ſome uſeful concluſion or other! How much are you practiſed in the method of clear and ſcientifical reaſoning! How well do you underſtand the true uſe and ſignification of words, whereby to regiſter and compute your own conceptions! So well are you accompliſhed in all theſe particulars, that I ſafely perſuade myſelf, but, that you modeſtly think every ſcribler wiſer than yourſelf, that you can draw more knowledge and ſatisfaction from two hours of your own meditation, than from twelve hours endurance of other men's loquacity. For when you meditate, it is always upon ſomething, that you are not yet clear in (and a little armour will ſerve, being put upon the right place.) But when you read, you muſt take the chance, and perhaps be corrupted with lies, diſguſted with abſurdities, and tired with impertinences, or made ready to vomit, at the *bis (imò centies) recocta crambe* offered unto you. Beſides what a difference is there between walking with our natural legs and crutches! or between a cloth, whoſe ſubtegmen is the ſame from end to end, and another pieced up, out of a thouſand gaudy rags! But the proverb (*verbum ſapienti*) forbids me to be more tedious. The next diſeaſe you labour under, is, your apprehenſion of many diſeaſes, and a continual

fear, that you are always inclining or falling into one or other. Here I might tell you, the vanity of life; or, that to fear any evil long, is more intolerable, than the evil itſelf ſuffered, *&c.*

BUT I had rather put you in mind, that this diſtemper is incident to all, that begin the ſtudy of diſeaſes. Now it is poſſible, that it hangs yet upon you, according to the opinion you may have of yourſelf, rather than according to the knowledge, that others have of your greater maturity in the faculty. But *ad rem:* Few terrible diſeaſes have their pathognomonical ſigns; few know thoſe ſigns, without repeated experience of them, and that in others, rather than themſelves. Moreover, the ſame inward cauſes produce different outward ſigns; and, *vice verſa*, the ſame outward ſigns may proceed from different inward cauſes; and therefore thoſe little rules of prognoſtication, found in our books, need not always be ſo religiouſly believed. Again, a thouſand accidents may prevent a growing diſeaſe itſelf, and as many can blow away any ſuſpicious ſign thereof; for the viciſſitude, whereunto all things are ſubject, ſuffers nothing to reſt long in the ſame condition; and it being no farther from *Dublin* to *Corke*, than from *Corke* to *Dublin*, why may not a man as eaſily recover of a diſeaſe, without much care, as fall into it? My couſin *Highmore*'s curious hand hath ſhewn you ſo much of the fabrick of man's body, that you cannot think, but that ſo complete a piece as yourſelf will be always at ſome little fault or other. But you ought no more to take every ſuch little ſtruggling of nature for a ſign of a formidable diſeaſe, than to fear, that every little cloud portends a cataract or hurricane. To conclude, this kind of vexation hath been much my portion; but experience, and theſe conſiderations, have well eaſed me of it.

THE laſt indictment, that I bring againſt you, is, practiſing upon yourſelf with medicaments (though ſpecificks) not ſufficiently tried by thoſe, that adminiſter or adviſe them.

IT is true, that there is a conceit current in the world, that a medicament may be phyſick and phyſician both, and may cure diſeaſes *à quacunque cauſâ*. But, for my part, I find the beſt medicament to be but a tool or inſtrument. Now what are *Vandyke*'s pencils and pallet, in the hands of a bungling painter, to the imitation of his pieces? Recommendations of medicaments do not make them uſeful to me, but do only excite me to make them ſo, by endeavouring experimentally to find out the vertues and application of them. There be few medicaments, that can be more and more really praiſed, than diapalma and baſilicon; for they have been carried up and down in all ſurgeons ſalvatories, for theſe many hundred years: yet how few can perform any excellent cures by them, or ſuch others! How hard it is to find out the true vertues of medicaments! As I weep to conſider, ſo I dread to uſe them, without my utmoſt endeavours firſt employed to that purpoſe.

THOUGH none of theſe arguments prevail with you, yet I ſhall pray, that nothing of evil conſequent to the things, from which I have diſſuaded you, prevail upon you. The deſire of your encreaſe in knowledge, and (in order thereunto) of your health, hath made me thus troubleſom; for if what I have ſaid, came from any other principle, I ſhould be aſhamed to write myſelf thus confidently,

SIR,

your obliged ſervant,

W. PETTY.

Feb. 17, 57.

SIR,

WHAT you heard of my being ſecretary to his Excellency and clerk of the council, is too true; for I never lived a more miſerable life than now. I hope the meaning is, to try the ethics I diſcourſed of ſo at random in a former letter. I have not, amongſt all my intelligence, heard better news, than that the club is reſtored at *Oxford*. I hear likewiſe, that infuſio croci metal. has been injected into a live animal's blood, without any notable alteration. It were good to try the ſame with opiate liquors, and other of notable and ſenſible vertues. When I deſire the club to try theſe things, I do not excuſe myſelf; but would be glad they ſhould undertake it, that it might be thoroughly done. I received your commands (concerning a deſign, which colonel *Zankey* only appears in here, and in which only Mr. *James Rand* and Mr. *Eccleſton* are named) which I ſhall obey, upon your account; for, until you had written, I underſtood little of the thing; and therefore for me (who ought *non niſi pauca & benè cognita coram principibus loqui*) to appear much, before I had a better warrant, was not ſo ſuitable to my way. I had letters from Mr. *Hartlib* not long before, but without any mention of this affair; nor could I gueſs, but by his ſuperſcribing your letter, that he had any hand in it. For it is poſſible, ſome plagiary might have made uſe of the paper, which nine years ſince I left with him comprehending this whole deſign; for I could not believe he would think me diſaffected to what I formerly ſo much tendered. But I fear ſome enemy hath ſown tares. However, as for what lyes in me, I ſhall be induſtrious to get the allowance ſettled, and no leſs vigorous, that it be duly employed, both as to the main end, and to the encouragement of the beſt particular deſervers; for the riches of one man (who drinks but as he hath brewed) ſhall not ſtir me againſt any publick good, although, ſince I have been in this nation, I have ſtudied thoſe definitions of publick, *&c.* and have obſerved the nature of their non-miraculous degenerations. Dear Sir, I wiſh I had the opportunity to make you underſtand the ſtate of ſome things; till when, ſuſpend your judgment of me. I think I can demonſtrate the

cauſes

cauſes and neceſſity of the moſt malign action I am taxed with; wherefore I beg you to let me be (as we ſay, though but *de bene eſſe*) reckoned amongſt your true and faithful ſervants, for ſuch is

W. PETTY.

Letters from Mr. *Henry Oldenburg*.

Oxford, April 15, 1657.

SIR,

THOUGH I am much obliged to you for the favour of your ſpeedy diſpatch hither of what came to your hands from *Ireland*, yet I am little beholding, I think, to the poſt, which hath been crawling rather than poſting; yours being dated the 11th, which was Saturday, not coming to me till this wedneſday night, whereas, if it had not ſtuck ſomewhere, it might very well have been here on Monday. But thanks to you, Sir, are not a whit the leſs for that and other teſtimonies of your goodneſs and affection towards me, which I can give no retribution for, unleſs you will pleaſe to accept of my real eſteem of your deſerts, and make uſe of my readineſs to ſerve you with what my little power can compaſs.

THE non-reſolution of the buſineſs written about by my lady *Ranelagh*, though it be ſomewhat uneaſy to me, becauſe I cannot well delight to be in a place, where people think me to ſtand in their way; yet do I purpoſe, if God will, to defer our remove, till I receive one letter more from *Ireland*, and if that bring no reſolution with it, after a whole winter's debate, I muſt, I think, take the liberty of chooſing another place, where yet I ſhall have care, that your nephew may not more loſe his time, than he doth now here. Only his and my loſs will then be, Sir, our abſence from you, which I reckon a very great one, and ſhould never chooſe, if the forementioned conſideration did not compel me to it. Yet, before we part to a greater diſtance, it would trouble me exceedingly, if I ſhould miſs the advantage of conferring with you, Sir, about ſome things, which are concernful to your nephew and me. Wherefore, leſt we ſhould fall at one and the ſame time upon a croſs journey to and from *Oxford*, I beſeech you, you would give yourſelf ſo much trouble, as to acquaint me by a line or two with the time of your ſetting out again for *Oxford*; till the reception of which news he is very unwilling to ſtir, that is cordially,

SIR,

your obliged and
very humble ſervant,
HENRY OLDENBURG.

Mr. *Jones* is your moſt humble ſervant.

Saumur, Sept. 8. 1657. ſt. n.

SIR,

I THINK myſelf obliged to you, that, after the troubleſom journey, you mention in your letter, you would give yourſelf the trouble of excuſing your ſilence to my former; though I confeſs, I was glad to ſee it broken, and withal to find an intention in you of being larger, when your academical hurry ſhould be over. As for us here, we are, through the goodneſs of God, in perfect health; and your nephew having ſpent theſe two or three months, we have been here, very well, and in more than ordinary diligence, I cannot but give him ſome relaxation in taking a view of this province of *Anjou*, during this time of vintage; which, though it be a very tempting one to a young appetite, yet ſhall, I hope, by a careful watchfulneſs, prove unprejudicial to his health. I am perſuaded, Sir, if you were here, and would pleaſe to make with us ſuch a little, but very pleaſant tour, as this is to my knowledge, who have made it heretofore, it would conduce very much to your health. But, I doubt, your deſire of knowing and of advancing knowledge, and the opportunities of doing that much better where you are, than here (the way you take) will deprive us ſtill from the happineſs of enjoying your company here. Well, if the publick do but thrive, we ought to bear private loſſes with patience. In the interim, give me leave, Sir, to acquaint you with an obſervation I made the other day in reading a piece of *Thuanus*, which made me reflect upon your diſcourſe about the nature of poiſons, wherein, if I remember well, you ſeem to incline to the opinion, that the poiſon of vipers conſiſts rather in the rage, wherewith they bite, than in any part of their body, which hath always a deadly poiſon in it; confirming it with inſtances, from the madneſs of a dog making his teeth poiſonous, which before were not ſo; and from an inraged cock, killing a man by a ſlight hurt. The author I named gives another inſtance, which, if true, may, in my opinion, juſtly claim a place among the reſt. He relateth (Lib. IV. ad ann. 1548.) that the Scots then beſieging a town, which he calls *Hadma*, taken from them by the Engliſh, and having both French and Highlanders in their army, one of the latter, ſeeing the French fighting ſtoutly, and then ſtirred up to emulation, ſoon ruſhed into the thick of the enemy, ſallying out, and his fury laying hold on one of the Engliſh ſoldiers, threw him, being a luſty fellow, upon his ſhoulders, and running away with him into the camp of his general, was by the way ſo bit in his ſhoulder (he going half naked) by the enraged teeth of the Engliſhman, that he failed very little, as the author ſaith, of being killed by that wound. The ſtory ſeems at leaſt as credible, as that of the cock, unleſs you will ſay, a cock can be chafed to greater rage, than an Engliſh ſoldier carried away by a naked Scotſman on his ſhoulders into the camp of the enemy. To this ſtory I ſhall add another, and then, Sir, end your trouble; but the author I had it from, is not ſo authentick as famous monſieur *de Thou*. It was an Italian, who told me but the

the other week, that pope *Urban* VIII. never did eat any pullets or other tame fowl, but ſuch as had been fed and fatned by the fleſh of vipers, and that his long popedom was aſcribed (*humanitus loquendo*) to the virtue of ſuch food. The thing itſelf, I believe, Sir, you will think very credible, ſeeing men ordinarily enough eat broth, wherein viper-fleſh hath been boiled for to fortify or recruit nature. I wiſh cordially you alſo may find means powerful to preſerve and ſtrengthen yours, for the good of the learned commonwealth; in which preſervation would be particularly involved much joy and advantage to him, who as long as he liveth deſireth to be,

SIR,

your faithful,

and humble ſervant,

H. OLDENBURG.

YOUR nephew and ſelf entreat your favour of preſenting our humble ſervices to all our noble and learned friends at *Oxford*.

SIR,

YOURS from the 2d of *September* (received by us the laſt of the ſame) intimating, that you had not heard from us a very long while, obliged me ſoon after the receipt thereof to acquaint you, that we have taken the freedom to viſit you twice, by our letters in our journey from *London* to *Saumur*, and as often, ſince we have been at *Saumur*; but been ſo unhappy, as never to hear from you, but once before this, which we now humbly thank you for. I hope, ſince our letters have once found the way to and fro, they will not miſs hereafter; and I rejoice to hear you ſpeak of your indiſpoſition in præterito, adding my hearty wiſhes and prayers, that the goodneſs of God would pleaſe to confirm your health, and to keep from you all ſickneſs in time to come, but that uſeful one, which, as you ſay, maketh men fond of charcoal and loam; with which I find none in this place to be troubled at all, having made ſo little ſtay in the other towns, which we have paſſed through, that other occaſions did not permit me to make enquiry after the lovers of that knowledge. In making our tour hereafter, I flatter myſelf with the hopes of finding ſome ſuch at *Montpellier* and *Marſeilles*, and if I could meet with a Peireſkius in thoſe parts, or any where, that is not too far out of our way, I ſhould exceedingly rejoice. Making uſe here of an Italian, to teach your nephew ſomething of practical geometry and fortification, I found, he had a way of writing to others very ſecretly, which, though he would not exchange with me for another, I have by your favour, yet he did it at laſt for that, which, as the lyrick poet ſaith, *perrumpit omnia potentius ictu fulmineo*. And thinking you have it not this way, I did venture to ſend it here incloſed, being tried by me, and doing very well. It may be of great uſe, amongſt others, for beſieged towns, to encourage them with unſeen promiſe of ſuccours, unſuſpected by the beſiegers, the white characters being wrltten over by black ones, of quite another ſenſe, which may be ſuch, as that the beſiegers, if the meſſenger ſhould fall into their hands, would not ſtop, but rather be glad to let paſs; which yet the beſieged will, by a water, mentioned in the receipt, blot out and make appear what concerneth them and their relief.

I AM hugely pleaſed, that the council hath granted your deſires for the promotion of knowledge; which I ſuppoſe to be thoſe, that were couched in a certain petition, you were pleaſed to impart unto me at *Oxford*; wherein, if I remember well, a matter of twelve thouſand pounds ſterling was offered to purchaſe confiſcated lands and houſes with in *Ireland*, and to commit the profit thereof into the hands of certain truſtees, for to employ it in the entertainment of an agent, ſecretary, tranſlators, for keeping intelligence, diſtributing rewards, *&c.* in order to the end aforeſaid. I beſeech you, Sir, to favour me with acquainting me with the progreſs of this buſineſs, and, if it diſcommode you not too much, with what elſe occurreth notable in *England*: half a word, or a word uſed *per antiphraſin* (ſince you muſt uſe the pen of a ſervant) will be enough to make me underſtand your meaning, eſpecially if you ſhall pleaſe to add but a N. B. to ſuch matters, as you ſhall not think fit to ſpeak freely and plainly of to ſuch kind of perſons. Whereby you will very much encreaſe your obligations upon,

SIR,

your moſt faithful

and humble ſervant,

H. OLDENBURG.

RECEIPT.

Prenez 1 *ou* 2 *onces de vinaigre diſtillé, &* ½ *once de lithargyron en pierre, & ayant pulverisé ceſtuy-cy, mettez-le dans le vinaigre, & avec cela eſcrivez en lettres blanches tout ce que vous voudrez enſeigner ſecrettement à voſtre amy. Apres, bruſlez un morceau de liege* (cork) *juſques à ce qu'il ſoit tout charbonné & ne bruſle plus: alors eſteignez le avec un peu d'eau de vie. Mettez ce charbonné en poudre, & y ayant mis un peu d'eau de gumme, faitez en de l'encre, avec lequel vous eſcrirez tout une autre choſe ſur les predites lettres blanches. En fin, prenez* 1 *once d'orpiment, & l'ayant auſſi pulverisé, mettez le avec* 2 *onces de la chaux vive, qui ſoit bonne & vigoreuſe, & apres mettez les enſemble dans une phiole de verre ou d'eſtain, tenant une chopine* (an Engliſh pint) *& l'ayant remplie de l'eau commune, agitez le par* ¼ *d'heure: & ceſt eau ſervira à merveille pour effacer les lettres eſcrites de l'encre, & pour faire apparoiſtre à votre amy tout ce que vous aurez eſcrit en lettres blanches.*

* * * * your

Saumur, March 29, 1658.

* * * * your nephew having alſo waited on you ſince with another letter, and being, together with myſelf, extremely coveting to receive ſome good news of your health and welfare; which, if you ſhall pleaſe to gratify us with, we entreat you to ſend it only, as formerly, to Mr. *Hartlib*, who hath order to direct henceforth thoſe letters, that concern us, to *Geneva*; where I have a friend, that will not fail to diſpatch them to me, whereſoever I ſhall be in *Germany*, which, I think, will be the country for our ſummer ſtation, becauſe likely to be the theatre, as of a great ſolemnity, ſo of other conſiderable tranſactions. But no appearance, I think, to make afterwards an excurſion into *Italy*, and thence to bring you news of the induſtrious *Kircher*'s ſubterraneous world, his ſtrange *grotta de' ſerpi*, his ſtory of the growth of pulveriſed and ſown cockles, irrigated by ſea-water; his thermometer by a wild oat's-beard; his vegetable phœnix's reſurrection out of its own duſt by the warmth of the ſun; his pretended ocular confutation of *Kepler*'s magnetical motions of the planets about the ſun; and of *Gilbert*'s magnetical motion of the earth, and of twenty other remarkable things, one might yet have the ſatisfaction to be punctually informed about, if our friends did not think to have reaſon to diſſuade us from that voyage, wherein we ought to acquieſce, if they ſtill judge them important enough to hinder it. In the interim, what particular enquiries you think in *Germany* may be made of us about philoſophical experiments, I entreat you be pleaſed to give in your next a hint at: and, to conclude, do not think it a trouble to advertiſe us, what ſucceſs that promotion of learning hath, for which the council did formerly grant your deſires, if he miſtake not, who is,

Sir,

your obliged, and

very humble ſervant,

H. OLDENBURG.

Paris, May 17, 1659.

SIR,

AS I find the favour of the good opinion you are pleaſed to have of me, as upon other occaſions, ſo in the late addreſs of Mr. *Robert Southwell*, to my advice in order to his travels, very advantageous to me; ſo I doubt very much of my capacity in anſwering the ſame as it deſerveth: yet wherein I come ſhort here, I ſhall, by the aſſiſtance of God, ſtudy to make up by a ready faithfulneſs to aſſiſt and ſerve him, in whatſoever I can. I find this perſon very ingenious, and well inclined, apt to make good uſe of travelling; but yet, for ſome conſiderations, do doubt very much, whether one may adviſe him to go into *Italy* thus alone, as he hath no ordinary deſire to do. It is a very peſtiferous climate, and vice hath a fermenting quality; unleſs a man be well antidoted and armed, he will hardly eſcape ſound and uninfected from thence. Wherefore I am alſo apt to believe, that my lord *Dungarvan*'s friends will very well conſider, before they counſel or permit him to make that voyage. You know, Sir, how few there are, that in the ſtrength of him, in whom we can do all, take up a reſolution againſt vice, and the ſatisfaction of their ſenſes; as alſo, how few there be of ſuch guides, that are ſolicitous and watchful to warn thoſe, whom they guide, againſt thoſe moral dangers, which every where, though in ſome places more than in others, do attend us.

I HOPE, Sir, my letter from the 21ſt of April, that did acknowledge your bounty, and gave you ſome account of what you demanded, is come to your hands. I have ſince received from a gentleman, that liveth in the extremities of *Languedoc*, on the ſhore of the Mediterranean, the receipt of an oil, which he told us, when we viſited him, had done great cures. Methinks, the ground of it anſwereth your *Ens Veneris*. I thought myſelf obliged to impart it unto you, and to deſire you to examine it, whether it is capable to produce ſuch effects, as the ſaid perſon (who found it in ſeeking after, and working for *Butler*'s ſtone, according as Mr. *V. Helmont* hath written thereof) did relate unto us, which are, the curing of megrims, palſies, lameneſſes, crookedneſſes, and all ricketing diſeaſes. I ſend it juſt as the author ſent it me, without deciphering his characters, as knowing, you need no ſuch thing. I add hereunto ſome few ſeeds of the ſenſitive plant, which I was preſented with here, and you may try, how they will ſpeed at *Oxford*; as alſo ſome grains of bama muſcata, which come from the iſles of St. *Chriſtofle*, growing upon a tree of three or four feet high, bearing yellow flowers, which the negroes uſe in their potage, juſt as the Engliſh do marigold-flowers. He, that gave them me, ſaid, that having put ſome of theſe grains into good ſpirit of wine, and left them there infuſed three or four days upon ſome little warmth, till the ſpirit had drawn the ſcent thereof, he had taken out the grains, calcined them, and drawn a ſalt from them, which being infuſed into *l'eau de vie foible*, and having poured upon it ſome of the former ſpirit, endowed with the ſcent of them, had made him urine much: inſomuch, that he hath a belief, theſe grains duly prepared may prove good for the gravel: if you view the figure of them well, you will find it like to that of the reins. I had ſome other things in my thoughts to extend this letter with, but company comes in, and obligeth me to free you from further trouble. Only be pleaſed to receive the aſſurance, that I am,

Sir,

your moſt humble,

and obliged ſervant,

OLDENBURG.

Oleum Vitriolinum.

℞ *Vitriolum melioris notæ. Hoc deſtilla eo quo decet modo magnus V. Helmont. Deſtillati* ☉ *calcina ut, ibidem dictum. Calcinatum miſce cum ana* ✱ *&* ♎ *bis aut ter. Habebis ſublimatum rubicundiſſimum in frigido ſolubile in oleum pretioſum, cujus aliquot guttulæ aliquamdiu cum oleo communi maceratæ, illud colore rubicundiſſimo tingunt. Quod hoc modo debite præparatum eadem, quæ multoties expertus ſum, & vobis narravi, effecta præſtabit, ſi Deo omnis boni largitori placuerit.*

Paris, March 20, 1660.

SIR,

AS I am much obliged to you for your liberality of preſenting me with thoſe two deſired treatiſes of plants and manners, and of ſending them to my lady *Ranelagh* for me, ſo I am altogether aſſured of her ladyſhip's care in tranſmitting you hither, if a good occaſion had preſented itſelf ere this. The explication of the Arabick inſcription was very welcome to thoſe concerned therein, and they return, together with my ſelf, their humble thanks for it, and tell me, that it agreeth with the ſenſe of what a Frenchman, moſt ſkilful in the oriental tongues, hath ſaid of it; which confirmeth very much the owner of the jaſper in the interpretation of Mr. *Potock*, and derogateth nothing from the eſteem he is in. Sir *K. Digby* will himſelf aſſure you, by the annexed, of his reſpects to you. We met lately at the houſe of a chemiſt, where the queſtion was agitated about the diſſolvent of gold, whether the univerſal ſpirit of the world in its undetermined nature, or as it is ſpecified and contracted to a mineral, be the menſtruum of that noble metal? The diſcuſſion hereof being rather made by authority, than reaſon, gave ſmall ſatisfaction to the auditors; whereof the learned knight being the chief, did moderate the action, but not determine the queſtion; interlacing the diſcourſes of others with the ſeveral conſiderable relations, whereof two did raviſh the hearers to admiration. The one was of a king's houſe in England, which having ſtood covered with lead for five or ſix ages, and being ſold after that time, was found to contain $\frac{1}{4}$ of ſilver in the lead thereof. The other was of a fixed ſalt, drawn out of a certain potter's earth here in *France*, at a place called *Arcueil*; which ſalt being for ſome time expoſed to the ſun-beams, became ſaltpetre, then vitriol, then lead, tin, copper, ſilver, and, at the end of fourteen months, gold; which he aſſured to have experienced himſelf, and another able naturaliſt beſides him. I muſt confeſs, I had rather ſee this, than believe it, though the author be a very authentic gentleman.

THE name of the Carteſian author, that hath written of the cauſe of purgation, is one monſieur *Nicholas Lienard:* the treatiſe is a very ſmall one in French, containing but twenty leaves in quarto; which yet is too big to be ſent by the poſt, or elſe you ſhould not be long without it. I am confident, your experiments about this purging vertue of medicines will prove more convincing, than his ratiocinations, though they be very plain and intelligible, yet not unmixed with ſome juvenile ſcholarſhip.

I CAN learn nothing of any new books, treating of the Epicurean or Carteſian principles; and I am perſuaded, that, if there be any new ones come lately abroad, the news thereof will ſooner come from *Holland*, than theſe parts. We long much, Sir, to ſee your epiſtle, which giveth an account of certain experiments made about a pneumatical engine; but I doubt, we ſhall not ſee it, till we have the happineſs to ſee you; which is much wiſhed for by,

SIR,

your faithful and

very humble ſervant,

OLDENBURG.

London, June 10, 1663.

SIR,

I COULD not forbear by this occaſion to give you notice of ſome particulars, imparted to me ſince your leaving *London*, eſpecially ſuch, wherein yourſelf and the other Engliſh virtuoſi are concerned. My correſpondent in his laſt from *Paris* ſaith, with a great deal of frankneſs: *Il faut avoüer, que les Anglois l'emportent, & ont l'avantage par deſſus les autres peuples de l'Europe, nous ayans donné quantité de choſes curieuſes & particulieres, outre les grands ouvrages, qu'ils ont donné au public. Au contraire, les livres, qui s'inpriment à Paris, ne meritent pas d'eſtre leus, au moins la plus part, ny ayant que des redites ou des allegations; mais rien de particulier, qui contente l'eſprit.* Then he paſſeth on to a gentleman, called Mr. *Boyle*, and ſaith; *On l'admire plus que jamais, & monſieur Ozou* (that is, one of the conſiderableſt members of the Monmorian academy, and a very mathematical head) *à une eſtime tres particuliere pour luy. Le meſme eſt grand admirateur de voſtre ſocieté, & ne ſe peut laſſer de loüer le genie des Anglois, pour avoir fait grande quantité de belles choſes. Nous ſerions bien aiſes de ſcavoir, ſi on continue dans la meſme curioſité.* In the end of his letter, he mentions, that he hopeth to get the obſervations, made by *Borelli* upon your *Chemiſta Scepticus*, which being obtained, he promiſeth to ſend me ſpeedily.

THIS afternoon we had no ordinary meeting: there were no leſs than four ſtrangers, two French, and two Dutch gentleman; the French were, monſieur *de Sorbiere* and monſieur *Monconis*; the Dutch, both the *Zulichem's*, father and ſon: all four inquiſitive after you. They were entertained firſt with ſome experiments, which the bearer hereof will give you a good account of; and afterwards with good ſtore of occaſional obſervations, diſcourſed of promiſcuouſly, *pro re nata*; which the ſtrangers (as well as our company) ſeemed to be much

more pleaſed with, than with ſet and formal diſcourſes: they were, 1. Of various petrifications, even of children in the womb; item in the lungs, in the plexus choroides, and in all the parts of human bodies. 2. Of perſons altogether moveleſs, but that they could ſpeak, and eat and drink; whereof one was alledged by Sir *R. Moray*, ſeen by himſelf at the *Spaw*; out of whoſe fingers, and cheeks alſo, he had obſerved a chalky matter to iſſue. Another was mentioned by Mr. *Beale*, in a letter to me, of his own kinſwoman, that lived ſome years as unmoveable as a ſtone, unable to move finger or toe; yet her mouth ſhe could move, and had a good ſtomach, and was recovered at laſt by baths. I doubt, Sir, here is matter for an occaſional meditation.

NEXT, there were very odd relations made of women voiding bones, together with their menſtrua, every month; of others bringing away bones of children (they had been ſeveral years before big of) by ſiege, or out of their ſides.

THEN there was occaſion given, by a petition made to the king, for a patent to practiſe a ſecret for the improving of any barren ground, and of flowers, plants and young trees, and among them, of vines and orange-trees, to make thoſe grow as plentifully as in *France*, and theſe, as in *Portugal:* by this, I ſay, occaſion was given to ſpeak of the ſmutting of corn, with the deſcription of it; its differences from other vices in corn; with the conjectures of the cauſe of it, and the probable means to avoid it. Concerning all which, Mr. *Long* brought in a handſom diſcourſe; which I have by me, for your ſervice, when you pleaſe.

MUCH alſo was ſpoken of the advantage of ſowing corn with the huſks; and of planting fruit-ſtones with ſome pulp about them.

MONSIEUR *Monconis* was ſo obliging, upon the ſociety's deſire, to leave them in writing his way of knowing the difference of the weight of liquors; as alſo, the manner of ordering ſilkworms in *France* and *Italy*; where are contained ſome very pretty and not obvious obſervations.

BUT, Sir, I forget to whom I write, and by whom. I ſhould have told you ſome news, and I would write more, but that I have written too much. Yet this I muſt add, that the treaty with *Rome* advanceth not; that the conſiderabler ſort of French proteſtants are tempted to apoſtaſy; that *Spain* hath had ſome ſucceſs upon *Portugal*; and that *Sweden* is grown jealous of *France*, becauſe of the French kindneſs to, and alliance with *Denmark*.

IT is after midnight, Sir, that I write this; which will, I hope, the more prevail with you to pardon this undigeſted ſcribble to,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

SEEING the abovementioned ſtrangers are like to continue here yet a while, at the leaſt ſome of them, the ſociety ſhall much ſtand in need of a curator of experiments; which, I hope, Sir, will the ſooner procure from your obligingneſs a diſpenſing with Mr. *Hook* for ſuch a publick uſe.

London, June 22, 1663.

SIR,

YOUR receipt for monſieur *Monconis* came, after he had taken his leave from us; but I ſhall not fail, God permitting, to ſend it after him by the firſt conveniency. On Wedneſday laſt there were admitted into the ſociety my lord *Craufurd Lindſey*, meſſieurs *Huygens*, and *Sorbiere*. An experiment was tried in the compreſſing engine, but again without ſucceſs; the force of the air, thruſt in, breaking the cement, that faſtned the glaſs. In the experiment of the precedent meeting (whereof, no doubt, you had an account from Mr. *Hook*) the air, put into the place of the bubble, remaining in one bolthead, was vaniſhed, as well as the bubble, that was left in the other bolthead. After this, petrifications were again diſcourſed of; and the colours of inſects: there were alſo a couple of letters read, ſent to me, one from *de la Quintinye*, containing a farther account of melons; the other from Mr. *Beale*, relating his obſervations of the ſmut of corn. I had a third letter from *Paris*, written by the ſame gentleman, that is the author of the diſcourſe *de calore*, and hath ſo particular an eſteem for you, as I mentioned formerly. He tells me now, that the king of *France* hath beſtowed a largeſſe of eighty thouſand livres upon ſeveral learned men, but moſt poets and romancers, except *Huygenius* and *Hevelius*, and *la Chambre*, having neglected *Roberval*, *Fermat*, *Frenicle*, *Rohault*, *Ozou*, and ſuch like, *qui colunt muſas ſeveriores*.

THIS friend ſheweth himſelf ſo much concerned for you, that he writeth thus: *Il faut plus attendre de monſieur Boyle, à mon advis, que de tous les autres enſemble: c'eſt pourquoy je ſuis fort affligé de ce qui le menace. Exhortez le puiſſamment à avoir ſoin de ſa ſanté: je ſuis perſuadé, que s'il s'y applique, il fortifiera ſa conſtitution, & ſe garentira d'une maladie lente. Un de mes amis, avec qui je plaignois ce malheur, m'a aſſuré, qu'un ſeigneur Anglois, menacé de meſme, fut conſeillé de paſſer en France, ou l'air ſeul reſtablit ſi bien ſa ſanté apres quelque ſejour, qu'il retourna en Angleterre, ſans qu'il retombat de ſa vie en aucun peril de ſa premiere maladie. Propoſez luy la choſe: il pourra philoſopher par tout, & faire proviſion de ſanté pour philoſopher plus long temps.*

YOU ſee, Sir, his kindneſs for the advantage of your health, though ſuch abſence would turn to the diſadvantage of your friends here, *pro tempore*.

HE prayeth me, to entreat you to communicate unto him, if it may be, the way, which Dr. *Willis* mentions in his treatiſe *de Fermentatione*, p. 64. (ſuppoſing, your curioſity hath prompted you to get it from the ſaid author)

viz.

viz. to draw without any corroſive, *ſolo calore lento*, the tinctures of bodies with all their vertue. I dare engage for him, as well as for myſelf, that it ſhall remain a ſecret, if it be one.

THERE is going for *France* a friend of mine, by whom I could ſend a good packet, with ſafety; if you ſhould think fit to preſent monſieur *Thevenot*, the author of the late voyages in French, with one of your books, of the Uſefulneſs of natural philoſophy, he underſtanding Engliſh pretty well; I intend alſo, God willing, to ſend him one of your Latin reply to *Linus*, and another to monſieur *Martel*, the writer of the forementioned diſcourſe of heat. For this cauſe, have I taken two or three exemplars of this latter piece from Mr. *Crook*, ſuppoſing your leave to do ſo; that I might not neglect ſo fair an opportunity of ſending, as is now offered to,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

THE friend, that is going for France, purpoſeth to go hence on Friday next.

London, July 2, 1663.

SIR,

THOUGH I hope this will meet you on your way *London*-wards, the eight or ten days, which you allowed yourſelf in your letter for the reſidue of your ſtay at *Lees* being now elapſed; yet the mixture of my fear, leſt the influence of that conſtellation you then named, ſhould arreſt you longer where you are, I thought I would try, whether the operation of the ſtars (ſince they are held but to incline) might not be diverted by the power of a Royal Society, who are now freſhly ſet upon it, to give their royal founder and patron a philoſophical entertainment, as ſoon as poſſibly they can make one ready fit for him. In order to which, their council have ſet apart an extraordinary day, which is Monday next, the 6th of July, to agree upon the experiments and diſcourſes proper for his majeſty's reception: at which meeting they will be very glad to have your preſence and contributions, as highly valuable to this purpoſe.

THE book of the Uſefulneſs of experimental philoſophy was preſented according to your deſires, and received with applauſe and thanks, but to be returned, not to an anonymous, but to Mr. *Boyle*, whom I alſo intreat to accept of my humble thanks for the preſent of one of the books to me. I have let my friend paſs to *Paris* without an exemplar thereof to Mr. *Thevenot*, upon the conſideration ſuggeſted in your letter.

WHAT was done yeſterday at our meeting, I ſuppoſe Mr. *Hook* giveth you an account of by this ſame carrier. The ſurpriſing victory of the Portugals is ſo great, that the king of *Spain* acknowledgeth, in a letter written by his own hand to the queen-mother of *France*, that his army of 18,000 men is reduced to 6,000. This will give a *tanto de naſo* to his holineſs, whoſe heart did ſo ſwell upon the ſucceſs of the *Spaniards* in the taking of *Evora*, that he diſpatched away new orders to *Raſponi*, which did ſo diſguſt the French, that the treaty thereupon is broke off *pro tempore*, which certainly cannot be reſumed, but with great diſadvantage to the pope, who now runs the hazard of ſeeing a patriarch ſet up not only in *Portugal*, in caſe he refuſe any longer to confirm their biſhops, but alſo in *France*; which if it happen, I ſhall then look upon the pope, as little better than the king of *Spain*'s chaplain.

AND I will let any conſcientious man judge, whether he deſerveth not to be covered with confuſion, who offers, as the pope doth, (if my information be true) *charta bianca* to all thoſe, that will only agree, 1. not to diſpute his ſuperiority; 2. not to give ſcandal, leaving you for the reſt to believe and do what they liſt. If the chriſtian church had no other head, but ſuch an one, who would be a Chriſtian? Certainly not he, that is,

SIR,

your faithful humble ſervant,

H. O.

IF peradventure the ſtars ſhould prove ſo powerful, as to keep you beyond the mentioned time, the council will take it extreme kindly, to receive your ſymbolum of experiments in writing, as ſpeedily as may be, ſince they would go about the trial of them immediately.

London, Aug. 25, 1664.

SIR,

I AM forced to begin this letter, with complaining about the retardment of the work of the preſs, for want of thoſe Latin ſheets I looked for by the return of the coach, that carried you to *Oxford*. If they ſhould be loſt, I know not how that loſs could be well repaired; and the printer is already impatient for ſtopping his preſs, which attendeth this book. I hope, Sir, you will take all poſſible care to ſilence theſe clamours, and to direct me what to do in this caſe, eſpecially if the papers ſhould not be found.

WE have conſiderable news here from *Holland*, *viz.* that they have made very ill uſe of the king's engaging himſelf to their embaſſador, that he would attempt nothing upon their *Eaſt India* fleet, ſeeing they have ſent order to *Van Trump*, whom they had diſpatched with fifteen frigats to ſafeguard home the ſaid fleet, that they being ſecured by his majeſty's parole of the ſafety of the fleet, he ſhould quit you and paſs to *Guinea*, and ſeek

his advantage there againſt the Engliſh. This action hath ſo exaſperated the court, that it is thought, a war cannot now be avoided. In the mean time, there are eighteen ſhips of ours, partly ready, partly making ready to go for *Guinea*, and there to maintain the Engliſh intereſt. The plague increaſeth ſtill in *Holland*, there dying the laſt week about a whole thouſand, whereof there were not above 150, that died of other diſeaſes. This maketh them, it ſeems, more reſolute for a war, ſeeing they have no trade, and ſo think themſelves fit for nothing but fighting. What they will do with all theſe *Eaſt Indian* commodities, and other wares, that lye in abundance upon their hands, ſince they are almoſt excluded from all ports, I cannot imagine.

IT is confirmed from thence, that there is a company in *Holland*, that have great hopes to paſs into *China* and *Cataya* by the north, and that they earneſtly demand an octroy for it. What paſſage this ſhould be, differing from that, which was attempted at the latter end of the laſt age by three ſhips, that endured incredible hardſhips, I have not ſkill enough to gueſs.

FROM *Paris* my correſpondent diſcourſeth thus; *Par voſtre procedé on voit bien, que vous voulez la guerre, en refuſant de rendre Cabo Verde, qui a eſté pris ſans juſtice. Les plaintes, que fait Downing à la Haye, ſont imaginaires & ſans fondement, ce qui fait croire à tout le monde, qu'il en faut venir à la derniere extremité. Sans la peſte on ne vous craindroit point, et ſi on vouloit ager comme il faut, on vois donneroit bien des affaires et bien de l'occupation. On ſouhaite icy, ſi la paix ne ſe fait pas, que les Hollandois ſoyent victorieux, n'eſtans pas ſi criminels, comme on les fait en Angleterre. Ils ont voulu rendre l'iſle de Poleron à vos gens, qui n'en ont point voulu, parce qu'ils n'avoient point d'hommes pour le garder. Meſſieurs les eſtats ont montré à Downing leurs cahiers de plaintes, qui ſont mieux fondées, que les voſtres aſſurent. Ne vous eſtonnez pas de ce que je vous dis, eſtans tous Hollandois icy.*

UPON this I have ſuggeſted to this gentleman, that I doubted very much, whether the Hollanders were as good French as they are Dutch, remitting him to his former letter, wherein he intimated, that upon the death of the king of *Spain* (who by the laſt poſt was agoniſing again) the king of *France* would do his utmoſt endeavours to poſſeſs himſelf of *Flanders* and *Brabant*, or at leaſt to enable *Antwerp* to regain their old trade by opening the Schelde, which muſt needs ruin *Amſterdam* in a ſhort time, and cannot but beget at the preſent great jealouſies in the United Provinces of the king of *France*.

I SHALL ſay little of the victory againſt the *Turks*, it being ſo notorious, though not ſo great as it was made in the beginning. I ſhall only give this touch, that comes from *Paris* concerning the ſenſe, that *France* hath of the importance of what they did in that action, *viz. nos François* (ſaith the letter) *paſſent pour les reſtaurateurs de l'empire, & veritablement ils on fait tout ce qui ſe pouvoit faire.*

FROM *Amſterdam* they write me word, that *Kircher*'s *mundus ſubterraneus* is advanced unto Lib. XII. and will be finiſhed within ſix weeks. There lye ready ſeveral books for me at *Paris*, and amongſt them ſome anſwer to *Paſcal*'s little book; but for want of a conveniency of ſending them ſafely, I muſt want them ſtill.

WE had yeſterday a terrible ſtory read at *Greſham*, ſent out of *Italy* by Dr. *Pope*, of a moſt dreadful tempeſt of thunder, lightning, rain, and hail, the like had not been in thoſe parts in the memory of the living. The hail was ſome of it as big as a tennis-ball, ſome as a Turkey egg, both for bigneſs and ſhape, ſtriking in eight ſeveral places thorough the top of the coach, wherein Dr. *Pope* and his company were travelling about *Padua*, and bruiſing ſome of the travellers, and beating others black and blue, as if they had been ſoundly cudgelled. The horſes were ſo ſcared, that they broke looſe, and run away; one of the horſes of another coach running into a river, and being drowned there. In ſum, the ſtory was thought ſo remarkable, that it was ordered to be kept upon our records.

HAVING found the top of *Paul*'s ſteeple a convenient place for ſome experiments, order was given yeſterday to try there the deſcent of falling bodies, the Torricellian experiment, and the vibrations of a pendulum of the length of the top to the floor of the church: the perpendicular height is about two hundred foot. Order was alſo given, that an inſtrument ſhould be made for diſcovering a ſecond of time by a ſun dial or the ſtars, which was looked upon as very conducive to the ſtating of an univerſal meaſure, though it was alſo judged very requiſite thereunto, to have a certain way to meaſure the preſent temperature of the air.

THE engine for meaſuring refractions was well examined, and at laſt approved of; with which many good experiments will now be made.

THERE was read a paper brought in by Mr. *Packer* concerning mine-damps, which will admit of no more but two kinds of them, which are there called fire-damps, and earth-damps, alledging, that that kind, which they call the water-damp, is nothing elſe but a vapour, that in ſome wet-damps will lye upon the water, even as a miſt eſpecially follows the rivers. He affirms, that the earth-damp is a vapour not at all viſible, though this kind be the moſt dangerous and deſtructive, it being far ſharper and of longer continuance commonly than the other. He adds a particular ſomewhat ſtrange, *viz.* that a workman aſſured him, that he being at *Chevin* cole-pits, and the damp being in the work, they hung a fire, as they uſe to do to get the damp out of the earth in the pit's mouth, which was made of at leaſt half a horſe load of coals, burning very fiercely; and notwithſtanding,

when it had drawn the damp up the ſhaft or pit, the fire was quite extinguiſhed, and put out as dead, as if caſt into a river; and being kindled two or three times again, was preſently ſtruck out, though no vapour or fume at all appeared, that could be called the damp, but the ſmoke of the fire only. He concludeth with the fire-damp, and ſaith, that when that is ſeen, it is like the ſmelting miln-ſmoke, and ſometimes it is ſo much, that it fills the whole work, at other times it is reduced to a little compaſs, and gets into a corner of the grove, and may lye there for ſome years, if not ſtirred into; and in other places the workmen may do their work, and not at all ſuſpect it, though working in the ſame grove: it may lye (ſaith he) in the compaſs of a diſh; but, if it happen to be touched by the workmen unawares, may deſtroy their lives, which it doth, (ſo he goeth on) by cauſing them to be ſo weak, that they are not able to aſcend the pit, and if not timely prevented, ſtriketh to the heart, and then there is little or no cure.

SIR, if you are not yet tired, I ſhall go on to tell you, that upon the ſuggeſtion of monſieur *Zulichem*, to try the vibrations of hard bodies ſounding, it was moved by Sir *R. Moray*, to make, inſtead of a bell, a flat round plate of bell metal, with a hole drilled in the middle, through which a cord may be drawn to hang it by; as alſo to have ſeveral of theſe round plates made of differing ſizes, to ſee what difference of ſounds they would produce, their edges being ſtruck upon.

MR. *Wylde* being preſent at the Society, promiſed them not only to ſhew them the experiment of ſoftning ſteel without fire, and hardning it again, but alſo of giving them the receipt how to do it; which the company was very well pleaſed with.

MR. *Howard* affirms to have the way of fixing log-wood, and offers to ſhew the Society an experiment of it; and it was committed to him, yourſelf, and Dr. *Merret*, to conſider of a way of fixing all ſorts of colours, which they hope you will do your ſhare in.

ON Friday laſt our committee for correſpondence met the firſt time at Mr. *Povey*'s, where we were ſorry to be without you, and without your queries for *Guinea*. In the mean time general enquiries were drawn up, ſerving for all the parts of the world; and authors were diſtributed amongſt the members of this committee, to be peruſed for the collecting thence particular enquiries for particular countries. This was our entertainment above ground: I leave you to gueſs what our correſpondence and entertainment was under ground, in the grotto, and near the well, that is, the conſervatory of ſo many dozen of wine bottles of all kinds.

BUT I muſt now eaſe you, after I have intreated your favour to enquire of Dr. *Wallis*, with my humble ſervice to him, whether he hath received that packet of Mr. *Horrox*'s letters, I did, by order of the Society, ſend to him for his peruſal, by the *Oxford* coach, Auguſt 13. You will pardon this trouble to,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

SIR, give me leave to entreat you, that in caſe you ſhould meet with any curious perſons, that would be willing to receive weekly intelligence, both of ſtate and literary news, you would do me the favour of engaging them to me for it. The expences cannot be conſiderable to perſons, that have but a mediocrity; 10*l.* a year will be the moſt, that will be expected; 8 or 6*l.* will alſo do the buſineſs.

London, Sept. 1. 1664.

SIR,

A THURSDAY laſt I ſent my letter to wait on you at *Oxford*, and to receive your commands for the ordering of the preſs about the Latin tranſlation; but I have not heard a word upon it, and thereby am left in much perplexity, what to do with the printer.

BEFORE I communicate philoſophical matters, I muſt let you know, what comes juſt now to me of ſtate-affairs, *viz.* that prince *Rupert* is declared general for *Guinea*, to command a fleet of twenty ſhips, almoſt ready to go thither, and to do what execution he can upon the Dutch there; which is a plain beginning of the war. The Dutch are likewiſe diſpatching thither, what ſtrength conveniently they can, to maintain what right they think they have there. They judge themſelves at the preſent, conſidering the rage of the contagion amongſt them, by which they are beat out of trade, fitteſt to go to war; and in all appearance they are like to have enough of it. We are about to forbid them all commerce with *England*, as *France*, *Italy*, *Scotland*, &c. have done already; whereby all their commodities will lye upon their hands, eſpecially thoſe, that came lately home from the *Eaſt-Indies*; which hath occaſioned the *Eaſt-India* company here to ſell their commodities, returned from thoſe parts, at an extraordinary rate, they having ſold within theſe three days for about four hundred thouſand pounds ſterling of wares, and, as I am informed, ſome of them at fifty *per cent.* gain.

THE news from *Amſterdam* holds, that ſome merchants there have found a north-eaſt paſſage to *Cataya* and *China*; but we are here ſo dull, that we cannot imagine, how they will or can make their way thither in that climate, unleſs they have found the ſea, by reaſon of its vaſtneſs, open beyond *Nova Zembla*, which, perhaps, continuing ſo for a great ſpace eaſtward, and ſo down again ſouthward, may bring them to their journey's end; which time will diſcover.

HIS

His majeſty intends to begin his progreſs next week, and expects to hear news of prince *Rupert*'s expedition at his return; and, accordingly, reſolve farther upon the war.

The French letters ſay this to me; *Le roy d'Eſpagne eſt tousjours fort incommodé, & ne peut vivre que fort peu de temps. Marcin a entevé deux regimens Francois aux Portugais. Le roy prend fort à cœur ſes pretenſions ſur la Flandre, qu'on ne laiſſera jamais à l'Empereur, & non obſtant qu'on lui l'a donnée par ſon contract de mariage, il aura de la penie à s'en mettre en poſſeſſion, ou au moins à en jouer paiſiblement. Le roy à plus de paſſion que jamais pour l'eſtabliſſement de la compaigne des Indes orientales, où il veut que tout le monde contribue. Mais pluſieurs doubtent forts qu'elle reuſſiſſe. La compagnie d' Hollande eſt trop bien eſtablie pour la pouvoir ruïner, principalement depuis qu'elle à obtenu la liberté de pouvoir trafiquer dans la Chine.*

On eſpere que les Turcs ſe retireront, & qu'ils laiſſeront les Chreſtiens en repos cette campagne. S'ils avoient des chefs, qui entendiſſent la guerre, ils nous donneroient bien de la peine, leurs ſoldats eſtans braves, & allans au feu vigoureuſement & aſſurement. Monſieur de Souches a le Danube entre luy & les Turcs, & eſt maiſtre de la campagne, où il eſt. La riviere de Raab eſt entre l'armee de l'Empereur & celle des Turcs, & ainſi les Chreſtiens ne courent à preſent aucun riſque; ce qui obligera les ennemis à ſe retirer.

Having tired you with news of ſtate, I will try whether I can do ſo too with news from *Greſham*. There was made an experiment for finding the velocity of a bullet, by the means of the inſtrument for meaſuring the time of deſcending bodies; which was ſo contrived, that the pendulum was ſet on moving by the bullet's paſſing out of the mouth of the gun, and a board was ſet up for a mark at a determinate diſtance, and a ſtring extended from that board to the pendulum, which was fixed juſt by the gun. It was thought, that by means of that ſtring, which was ſtretched pretty ſtiff, and ſo contrived, that a ſmall thruſt againſt the board would ſtop the pendulum, the impulſe of the bullet againſt the board would be preſently communicated back to the pendulum, by which means, that vibrating body being ſtopt at the very inſtant, would have ſhewn the time, that the bullet was paſſing from the mouth of the piece to the board or mark; but it was found upon ſeveral trials, that the bullet pierced through the board, which was three inches thick, and did not break a ſmall ſlender piece of white thread, which was to have ſtopt the pendulum. Order was given, to think upon a better way of making this experiment.

We have alſo begun to try experiments for meaſuring the time of falling bodies in water, and found yeſterday, that ſhot, let fall in a glaſs tube of 81 inches long, came to the bottom in about 2″. This is to be proſecuted in a larger veſſel, with bigger balls, and of ſeveral materials.

We made alſo a beginning with the experiments of meaſuring the refraction of common water, and found it about 14°.

On Monday laſt a club of our philoſophers went to *Paul*'s, to make experiments of falling bodies, and of pendulums: there were Sir *R. Moray*, Dr. *Wilkins*, Dr. *Goddard*, Mr. *Palmer*, Mr. *Hill*, Mr. *Hook*; and ſome of them went to the top of the ſteeple, and let down a pendulum of 200 foot long, with an appendant weight of ℔, and found 2 vibrations thereof made in 15″. Time would not then give leave to proceed to the other experiments, that were deſigned; among which will alſo be the Torricellian: but they will be ſet upon within two or three days.

I believe, Sir *Robert Moray* will himſelf let you know the news he received from Mr. *Zulichem*, concerning ſome new obſervations, lately made by one at *Rome*, of Saturn, confirming his ſyſtem, by the means of a glaſs, far better, by relation, than any of thoſe of *Divini*, wrought after a new way, without any mould at all. From the ſame hand you may alſo expect a farther relation concerning the poſt-chariot in *France*, how they now practiſe it all over that country, running with it from *Paris* to *Bourdeaux* in $4\frac{1}{2}$ days, which is no leſs, I think, than 300 miles. There is alſo more news about monſieur *Zulichem*'s new pendulum for longitudes; but that I am not at all able to give you any tolerable account of; but leave it altogether to the hand, that was entruſted with it, which is the ſame knight I lately named.

But yet, I have not done; I muſt add, and recommend to you, the liſt of georgical enquiries, which the committee for agriculture have pitched upon, as to arable and meadows; deſiring all their members, that have intereſt in the country, and acquaintance with experienced huſbandmen, to procure a good account and anſwer upon them; and not doubting, Sir, but that you will ſo effectually recommend them, and ſuch others, as you yourſelf ſhall deviſe and add, that a ſatisfactory return will be made to them. They are ſuch, as follow: * * *

London, Sept. 22, 1664.

SIR,

Having now received all the Latin papers, you had in your hands concerning the book of Colours, the impreſſion will be finiſhed, I think, within two or three weeks; and it may be ſooner, becauſe the Latin of the diamond obſervations were diſpatched before the return of the ſaid ſheets, the importunity of the printer extorting from me whatſoever I had of it; nor do I apprehend any conſiderable miſtake in that part (though it wanted your review) becauſe there is uſed more than ordinary care in the tranſlation of it. Mr. *Crook* is ready to begin the printing of the book of Cold, and doubts not to finiſh it within the time deſired, if he may be preſently and uninterruptedly furniſhed with copy. Mr. *Whitaker* telling me, he ſhould go to *Oxford* this week, and promiſing, that he would call upon me before his going,

I have

I have kept the weather-glaſs papers by me, to ſend them by him; which it will be neceſſary to return with ſpeed, to expedite the impreſſion the ſooner. Dr. *Merret* is willing to have his experiments of that ſubject annexed: he deſireth only, that if there ſhould be occaſion to name him, he may have his true name given him, which is not *Charles* (as the book of Colours hath it) but *Chriſtopher*; which, I ſuppoſe, will eaſily be granted him. You will pleaſe, Sir, to conſider, where it will be fitteſt to place them. The undertaker of the impreſſion will certainly obey you in the number of copies; but he is ſomewhat troubled, that he had not the additions, he looked for, for the reprinting of the *Scept. Chemiſt.*

I DID very lately receive the following lines about the Turkiſh bible: "As for the tran-"ſlation of the bible, I went" (ſaith my friend at *Amſterdam*) "to monſieur *de Geer* "myſelf, and deſired to know more eſpecially, "if any thing were done in the new teſtament. "He, to ſatisfy me, as much as he could, "carried me into his cloſet, where he ſhewed "me ſome letters of doctor *Warnerus*, even "of this year; but we could not find, that "yet he had done any thing in the new teſta-"ment; and therefore we would wiſh" (ſo he goes on) "that the perſon in *England*, that "hath done already an evangeliſt, and the "acts of the apoſtles, would go on, and make "an end of that moſt laudable work. What "matter" (ſaith he farther) "if we had two "tranſlations, to confront them together? "or, if you in *England* ſhould promote the "new, and we here the old teſtament unto "the Turkiſh people? Sure it is, that the "time is at hand, in which new evangeliſts "will break forth, to ſay unto *Sion*, thy "God reigneth." So far he.

Two days ſince, I received alſo an anſwer from Mr. *Hevelius*, to the packet I ſent him from the Society (wherein was contained the diploma of his election amongſt the reſt.) The anſwer is full of gratitude to his electors, and runs over with expreſſions of reſpect of their merit and deſign. The incloſed for Dr. *Wallis* came in company with that, which was addreſſed to me, which I could neither ſpare itſelf, nor make a copy of, for the preſent, to give you a full view of its contents. Yet I cannot but extract two or three particulars, which are indeed the chief things, mentioned by him, except his civilities to the Society. 1. *Nihil potius ducam* (ſaith he) *quàm ut quantocyus meas circa fixarum loca obſervationes deproperem; dummodò prius Cometographici noſtri labores penitus ad umbilicum fuerant perducti; id quod proximâ æſtate fieri poſſe ſpero.* 2. *Ad congreſſum ſolis & mercurii omni diligentiâ quocunque loco attendendum eſſe omnino judico; quantum in me erit, ſi Deus vitam ſereniratemque cæli concedat, omnem operam meam ea in obſervatione polliceor, tum quicquid ex ipſo cælo depromere licebit, lubens vobis communicabo.* 3. *Eclipſin ſolarem hujus anni de* 28. *Jan. ſt. nov.* (this is that eclipſe, which Dr. *Pell* ſent word of to the ſociety, that *Eichſtadius* himſelf, and almoſt all calendographers, had ſkipped over) *etiamſi, quantum ſciam, vix quiſquam in ephemeridibus vel calendariis mentionem ejus fecerit; tamen cùm mihi jam antea conſtaret, certò fore futuram, omni diligentiâ ad eam attendi, cæloque ſereno eam quoque obſervavi; de quo mihi valde gratulor; cùm pauci admodum illam deprehenderint. Num pariter à vobis in Anglia conſpecta & debitè annotata fuerit, ſcire geſtio. Sol cùm oriretur hîc Gedani, horâ ſcil.* 7. 50'. *fere, jam conſpicuâ parte obſcuratus erat: horâ* 7. 53'. *jam ad* $2\frac{3}{4}$ *dig. defecerat. Quæ obſcuratio magis magiſque poſtmodum increvit ad hor.* 8. 22'. *uſque ubi maximæ obſcuratio* $4\frac{1}{4}$ *dig. extitit. Deinde rurſus ſenſim lumen ſuum recuperavit. Phaſes ejuſdem eclipſeos* 22. *obſervavi ad ultimum uſque digitum hor. ſc.* 9æ. 15'. *Ab hoc tempore nubes intervenerunt, ut nihil prorſus amplius de ipſo fine animadverterimus.*

THIS I entreat you, Sir, be pleaſed to communicate, with my humble ſervice, to Dr. *Wallis*. I name not Dr. *Wren*, becauſe he was preſent, when the letter itſelf was read to the Society. I ſhall be very glad (and ſo will our vertuoſi) to receive from Dr. *Wallis* what philoſophical particulars may be contained in *Hevelius*'s letter to him. It may be, I ſhall by my next have leiſure to ſend to you both the obſervations of this Dantiſcan aſtronomer concerning two late moon-eclipſes, one of A. 1663. Aug. 18, the other, of A. 1664. Aug. 6. which latter was little obſerved of here, by reaſon of the cloudy weather.

YESTERDAY we had at our meeting the company of a Pariſian academiſt, recommended to Sir *R. Moray* and me. I have known him to frequent the meetings of monſieur *de Montmor*: his name is monſieur *Bley*, no unlearned, though here unknown, man. He was much pleaſed with our experimental method (though we had not any conſiderable experiments then ready) and with our ſedate and friendly way of conference, as alſo with the gravity and majeſtickneſs of our order. We had no other experiments, but that of breaking the ſteel cylinder with *P. Rupert*'s powder, and the deſcent of leaden, wooden, and wax balls in water. In the mean time, we ſupplied what was wanting here, by the reading of *Hevelius*'s letter, and ſome reflections thereon; as alſo with letting him ſee our contrivances for fetching up water from the bottom of the ſea, and the ſounding balls without a line; both which he was hugely taken with; as alſo with the ſtories of compreſſing a hollow leaden veſſel, by the preſſure of the ſea in the bay of *Biſcay*, and the æolipile by the ambient air, after the included air had been extremely rarified. I dare ſay, he will extoll our inſtitution and proceedings to the ſky, whereſoever he comes; though I muſt needs ſay, we grow more remiſs and careleſs, than I am willing to expatiate upon. Yet this I muſt ſay to a perſon, that I am ſure hath a concern for our proſperity, that nothing is done with the king for us; that our meetings are very thin; and that our committees fall to the ground, becauſe it is not poſſible to bring people together; though I ſolicit, to the making my ſelf troubleſom to others, not to ſay much

of the trouble, which I create to myſelf good ſtore.

BUT *manum de tabula*, after I ſhall have ſaid two or three words of ſtate news. The war like to go on; the king of *France* not like to intereſt himſelf much in it, but deſirous to let us engage together, as far and as deep as we pleaſe. The Turks ſeem to have recruited their courage. The French Eaſt-Indian company carried on with reſolution. The king intendeth to go to *Hampton-court* on Tueſday next; and then prince *Rupert* to embark. And here I leave news to haſten to aſſure you, that I am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London, Sept. 29, 1664.

SIR,

I HOPE you received your manuſcript of weatherglaſſes by Mr. *Hartlib*, and that they will be returned with all poſſible ſpeed. The ſociety took your ſuggeſtions of ſeveral experiments very kindly, and laid their commands upon me, to thank you for them. They were all looked upon as conſiderable, though the magnetical ones were judged not practicable at *Paul*'s, by reaſon of the abundance of iron, almoſt every where found in that place. That with a glaſs ball hermetrically ſealed in weighing of bodies on the top of the ſteeple and below, was preſently order given for, as a very proper one to diſcover, whether the difference of the weight of bodies above and below proceeds from the different degrees of the thickneſs of the air; which by this means will be done to a notable diſparity.

WE ſpent a great part of our yeſterday's meeting in proſecuting of the experiments of the deſcent of bodies in water. We had ready a body of wood almoſt cubical, another of the ſame matter double conical, one end tapering 3 inches; the other, 2; another cone, tapering 2 inches, with a flat baſis; another cone, tapering 1 inch; and then, a pyramid of 1 inch, and another of 2 inches, all theſe 3 with flat baſes's: laſtly, a cylinder and a globe: all of the ſame wood, and of the ſame weight, with an appendant leaden weight of 2 ounces. The firſt came to the bottom, in a ſquare veſſel filled with water, of about 8 foot high, in $12''\frac{1}{2}$; the ſecond, tapering 3 inches downwards, in $9''\frac{1}{2}$, and with the 2 inches downwards, in the ſame time, as to ſenſe; the third, in $7'''\frac{3}{4}$ circiter; the fourth, in $11''\frac{1}{2}$; the fifth, in 10"; the ſixth, in 8"; the ſeventh, in 12", and a little better; the laſt, which was the globe, in $9''\frac{1}{4}$, circiter. Theſe experiments will be repeated and carried on, the next meeting. The reſt of our time was ſpent partly in reading Dr. *Wallis*'s letter, in commending his care of digeſting *Horrox*'s papers, and in ordering him thanks; whereof the incloſed ſpeaketh more particularly; partly in taking notice of ſome experiments and obſervations, lately made abroad, and written to me, concerning refractions and the belts of Jupiter.

CONCERNING refractions, the Pariſian letler ſaith, *qu'elles ſuivent les raiſons des ſinus, & que celle de l'eſprit de vin eſt plus grande que celle qui ſe fait dans l'eau.* The latter part hereof our company underſtood not.

AS to the obſervations of Jupiter's belts, another letter from *Paris* to me mentions, that there having been a challenge for the excellency of optick glaſſes betwixt *Euſtachio* and *Campani*, thoſe of the latter were found better, than thoſe of the former; and that the firſt of July N. S. 1664, there were diſcovered in *Rome*, four belts in Jupiter, more obſcure, and two in the ſame, more clear, than the reſt of his diſcus. So that inſtead of two or three, we have now ſix belts in Jupiter. I am alſo deſired by that virtuoſo, who imparted me theſe things, to enquire here, how our obſervers ſaw Jupiter that day (vid. July 1, N. S.) and how they ſaw the ſatellites on the 25th of this month, N. S. But I can meet with none, that can ſatisfy this query.

CASATI, having been written unto by one of my Pariſian correſpondents, about the odd phænomenon of the liquor of biſmutum ſealed up hermetically, anſwers thus in his own language:

Quanto à quella eſperienza, di cui parlo nel libro, Terra machinis mota, *pag.* 143. *io ſteſſo non l'ho praticata, ſe bene per la forma del dialogo s'introduce Guldino, che ne parla, come ſe egli ſteſſo l'haveſſe fatta. Ella fu fatta da un tal giovane Boemo (il cui nome non mi recordo, ma ha ſcritto un libro di fontane & ſpiritali, ſtampato in Ferrara, come mi pare) il quale, con il ſignior don Innocenzo Conti ſtava generale delli armi in Ferrara, & puoi in Roma: detto ſignior al ſuo ritorno mi moſtrà, & in quel libro ancho ſta notata, la ſudetta eſperienza: ſe però ſe leggera bene cio chi io dico, ſi trovara, che quel liquore non creſce & cala ſecundo i periodi de fluſſi & rifluſſi marini, ma creſce né plenilunii & cala ne novilunii; & di quà ſi vede, come la luna può caggionare tali incrementi & decrementi; & ſi come gli caggiona in queſto liquore né plenilunii & novilunii, coſi ponno trovarſi nel mare altri corpi, che al ſalire della luna ſi gonfino, & al deſcendere ſi ſgonfino, & nulla più ho io preteſo di dire in tal luogo.*

Che coſa poi ſia il Biſmuto; cio è, una ſpecie di piombo cinerie, cio, mi recordo aver letto in G. Agricola, & nel muſæo metallico dell' Aldrovandi; ma io qui non havendo tali libri, non poſſo darne maggior notitia circa i luoghi della minera. Quanto poi al modo di eſtrahere quel liquore, non ſaprei più chiaramente dirlo di quello, che in poche parole ho detto nel libro.

THIS account maketh us not wiſer, than we were before; but as good as I had it, I would not omit to ſend it, remembring your concern in having it enquired after.

I HAD lately a letter out of *New England*, from Mr. *Winthorp*, but almoſt eleven months old, which I much wondered at. It refers to another

another letter, which I never received, and mentions only two or three not very conſiderable particulars; whereof one is about a mineral, that an Indian brought him, which is a kind of marcaſite, but differing from the ordinary ſort, being whiter and clearer; but Mr. *Winthorp* deferred trial, till he might have more, there being then brought to him but very little of it. He is alſo enquiring after another place, which, by the Indian's relation, gives ſigns of copper; of which he promiſeth to give me further notice of hereafter. He concludes, that he is neceſſitated to be up in the country far from the ſea, and fears, he ſhall not have opportunity, in that reſpect, to make trial about the ſalt-work ſo ſoon, as he intended; though he ſaith, he hath had men at work about it, ſince he arrived there. He preſents his humble ſervice to the whole Society, and particularly to the lord *Brounker*, Mr. *Boyle*, Sir *R. Moray*.

WE have received very conſiderable news from *Guinea*, by a ſmall frigat, that came yeſterday into the river from thence: it is, that major *Homes*, and ſome other ſhips, ſent thither to reinforce him, have not only taken four well laden Dutch ſhips, in thoſe parts, but alſo *Cape-Corſa*, and are now preparing to make an attempt upon the only remaining conſiderable place of the Dutch there, which is the *Caſtel della Mina*; unto which enterpriſe they are ſaid to have the readineſs of the aſſiſtance of 30000 natives, who are affirmed to hate the griping genius and ſevere government of the *Dutch*.

THIS I look upon as the foundation of an implacable war: and what can be the next, but that the *Dutch* will make it their whole buſineſs in the *Eaſt-Indies*, to expel the Engliſh thence? for which purpoſe, it is ſtrongly ſurmiſed, that they have already diſpatched orders over land thither, to put ſuch a work in execution, ſeeing they find *England* diſpoſed (ſo they ſay) to ruin them every where.

THE plague is now decreaſing, God be bleſſed, at *Amſterdam*, and the number of the dead is diminiſhed from 1050, to 800 a week; and amongſt theſe are ſeveral hundreds, that die of other maladies; it being obſerved, as I am informed, by the phyſicians of the United Provinces, that, whereas in the former plague, that reigned amongſt them, all diſeaſes turned to the plague (which they aſcribe to an univerſal putrifaction of the air) at this time it is otherwiſe, there being ſtill many other diſeaſes on foot, whence they conclude it to be no ſuch corruption of the air, but an infection brought thither from *Algier*, eaſy to be traced, ſtep by ſtep. I am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

SIR, *London*, Oct. 6, 1664.

WHEN I came home yeſternight from *Greſham*, I found your preliminary papers, which I was very glad of, and doubt not, but that according to the tenor of your laſt letter, the whole will be diſpatched with ſo much ſpeed, that the preſs ſhall not ſtay for it. I intend, God willing, to morrow to deliver to Mr. *Crook* what I have received, and to offer, by the way, what you propoſe to Dr. *Merret* concerning his appendix. It may be, he may think *Chriſtophorus* to be a better name than *Carolus*: however, I ſhall laugh with him, when I read to him your lines about it. I humbly thank you, Sir, for the note you were pleaſed to impart to me concerning the ſenſitive plant; and I ſhall double my acknowledgments, when you ſhall do me the favour of communicating the other way of propagating it. I was lately at young Mr. *Walker*'s, who carried me into his Virginian garden, and there ſhewed me a good number of the plants of that country, and, among them, the true ſnake-weed (as he aſſured it to me) thriving well. Being ſome weeks ſince put, by our committee of correſpondence, meeting at Mr. *Povey*'s, upon the peruſing the hiſtory of the articles, to draw up enquiries out of it, I met there with a whole wood, ſaid to be in the paſſage of the Iſthmus from *Nombre de Dios* to *Panama*, full of ſuch ſenſitive trees, which, as ſoon as they are touched, move all over, and make with their branches and leaves a rattling noiſe, winding themſelves alſo together into the figure of a globe. But, why do I take up your time in relating things, which you cannot but have taken notice of already, being ſo well acquainted with that author? I ſhould rather have told you, what was our buſineſs yeſterday at *Greſham*, where we examined, whether the experiment lately made at *Paris*, and communicated to me, concerning the exceſs of the refraction of ſpirit of wine above that of common water, did hold with us alſo, and found it did; that of water, when the angle of inclination was 30°. having an angle of refraction of 41°. 35′. whereas that of well rectified ſpirit of wine, at the ſame angle of inclination, had 42°. 45′. for its angle of refraction. Some body of the company, that hath too ſlender thoughts of all what comes from abroad of a philoſophical nature, or is done by ſtrangers, offered, before the experiment was made, to lay ten to one, that it would not be found ſo.

THE experiments of deſcending bodies in water ſucceeded not, becauſe of the leaking of the long ſquare veſſel with windows, in which they were to be made. Dr. *Charleton*, upon occaſion, mentioned to the company, that having killed a buzzard, and opened him, had found three ſtones in him, lying in a triangular way, but one of them being leſs than the other two. He was deſired to ſhoot another, and to make the diſſection thereof before the company. The phyſicians of the Society are to meet on Monday next at Dr. *Ent*'s, to conſider of what is to be particularly enquired after in the anatomical adminiſtrations this winter. Sir, you being of that committee, they will think themſelves not a little obliged to you, if you would pleaſe to

ſuggeſt ſome things, that may be worthy of further inveſtigation. If I had not been afraid of *Hudibras*, I had ſeconded Dr. *Charleton* with the relation of a certain apothecary in *Ireland*, who, as I was aſſured by a phyſician, that employed him there, has alſo three teſticles, being exceſſively given to venery. There is certainly ſomething as well in the conformation of the parts, as in the temper of animals, that neceſſitateth them (if I may ſay ſo) to ſuch and ſuch operations.

BEING yeſterday, before our philoſophical meeting, at a coffee-club, we had not only ſtate news, as that of prince *Rupert*'s being gone down to the *Hope*, to embark preſently in a fleet of eighteen men of war, and of the reſolution of the Dutch to paſs thorough the Channel with eighty ſail (whereof twenty are deſigned for *Guinea*, ten for the *Eaſt Indies*, and the reſt to convoy thoſe two parties a good way) but alſo of philoſophy, whereof I muſt ſend you one or two particulars, which were new to me, and, it may be, will not be unwelcome to you, eſpecially at this time, when you are reviewing your experimental hiſtory of Cold, if you have not met with ſuch relations already. One was, that in the northern countries, they have their French wines (for of theſe the relator ſpake only) frozen in the caſk, by putting them into water, whereby being thawed, the water encompaſſing the caſk with wine, freezeth all about it. The other was, that their fiſh being heaped up together in baſkets, and frozen, and covered over with ice and ſnow, inſomuch that you may ſnap them in pieces; yet when they come to be thawed thoroughly, they are often found alive. This latter ſtory agreeth with the Dantiſcan, of ſwallows frozen up, and reviving when thawed: *fides ſit penes authorem*, yet theſe relations deſerve farther enquiries.

To morrow, God permitting, I ſhall obey your commands in writing to *Amſterdam* for ſending you over a printed ſheet of *Warnerus*'s edition of the Turkiſh Bible. I rejoice hugely, that you have reſolved to carry on the tranſlation of the New Teſtament; and I hope, the tranſlator will publiſh with it his Turkiſh Dictionary, as it is much deſired by Dr. *Caſtel* and many others, although ſomething hath been already done of that kind in *Rome*; but that intelligent men think it not at all equal to what Mr. *Seaman* is able to perform therein. Sir, your intereſt in him may eaſily prevail with him to ſatisfy the learned and pious in this particular alſo. I confeſs, it will be troubleſom and dangerous to ſpread ſuch a book as the bible in *Turkey*; but yet it ought to be attempted, and much may be done in times of war with that nation, to inſinuate it to Turkiſh priſoners, and by their means to leaven the lump; and having done what is in our power, commit the ſucceſs to the wiſe and almighty author thereof, unto whoſe protection I commend you heartily, being,

Sir, your faithful humble ſervant,

H. O.

MR. *Southwell* is choſen clerk of his majeſty's council, in the place of Sir *George Lane*, who reſigned it, as I hear.

London, Oct. 13, 1664.

SIR,

THE reſt of your thermometrical diſcourſe is ſafely come to my hands; only I muſt give you a little advertiſement concerning the carrier, from whom, when it was ſent to my houſe, there was not only demanded by the porter his due for the pains of bringing it (which was ſatisfied by me, as formerly) but alſo for the carriage from *Oxford* to *London*: but when I looked upon the roll, I found a piece of the cover torn out, juſt where the words, *carrier paid*, are wont to be written: which making me ſuſpect a cheat, I refuſed to pay that part of the demand, ſhewing the ground of my ſuſpicion to the ſhe porter, that brought it me, who would put it upon the being rubbed off in the ſack among other things. But it was too artificially done, to be laid upon ſuch an accident; which made me perſiſt in my denial, and add, that I did intend by poſt to acquaint my correſpondent at *Oxford* with it; and in caſe it had not been paid there, I ſhould be ſo juſt as to pay it here.

THE firſt ſheet of this diſcourſe is printed, and I ſee Mr. *Crook* will make quick diſpatch, if there want not copy. Mr. *Merret* returns his humble ſervice to you, and ſaith, that the place for an appendix is ſoon found. Only, I pray, Sir, be pleaſed to intimate unto me, whether you would have it joined by any tranſition, and, if ſo, in what manner, or by none at all.

PART of our yeſterday's entertainment at *Greſham* was the hearing of ſome conſorts upon a revived muſical inſtrument, called Archiviole, invented by a Frenchman, twenty one years ago, and then notified here to Mr. *Haak*. There was about that time made one of them, to be preſented to the late king; the troubles intervening diverted the muſick, and left the inſtrument imperfect; which now is brought again to light, and by my lord *Brereton*'s care and expences made perfect, comprehending both an organ and a concert of five or ſix viols in one, giving an excellent harmony, very ſolemn and moſt fit for religious muſick; but only that the multitude of ſtrings maketh it ſomewhat longſom and tedious to tune, the alteration of the air putting them out of tune in a little time. *Merſennus* gave firſt notice of it hither, ſaying in a letter of his, which I have ſeen, *qu'un Ange, à ce qu'il luy ſembloit, ne pouvoit proceder plus ſimplement et gentiment*. I muſt confeſs, it tranſports me, and cannot but exceedingly pleaſe him, who plays upon it, hearing himſelf alone perform a whole concert of viols. The reſt of the time we ſpent in proſecuting the experiment of the velocity of bodies deſcending in water, where nothing occurred very

conſi-

conſiderable; 2. in appointing certain experiments to be made in the next anatomical adminiſtration; and 3. in giving order for ſeveral liquors, as wines, oils, lixiviums, ſea-water, to try their refractions. Since my laſt, I met with the perſon, that yearly goes to *Greenland* to the whale-fiſhing, who though he told me but ſad news of this ſummer voyage of theirs, as being rather a loſs than gain to them, yet he refreſhed me again, by telling me, that the ſhip, ſome ſeven or eight months ſince gone to the *Bermudas*, to fiſh whales there, hath had better luck, by killing ſeveral whales of a peculiar kind, that have no fins, but great teeth, and (which ſeems incredible) yielding an oil, which, though boiling, yet ſcaldeth not the hand, but feels only blood-warm: at which when I ſmiled as a fable, he would aſſure the truth thereof with all earneſtneſs, that can be deſired, proteſting to me, that two of the engagers had written it hither, and that he had read it in both the letters.

FROM *Paris* my friend ſaith, that he hath a relation for me at *Rome* of a woman, that hath been with child for an extraordinary length of time, without being delivered: and that he will ſend me ſome obſervations of one *Caſſini*, an aſtronomer, upon Saturn, made with the new glaſſes of *Campani*.

A TRUCE is certainly concluded betwixt the Emperor and the Turks; the ſuddenneſs whereof amazeth moſt people. The Emperor hath been very politick in this matter, making preſent uſe of the late advantage over the enemy, and offering to the grand viſier ſuch terms, as was wiſdom for him to accept, and not diſhonourable for the Emperor to grant; eſpecially conſidering the neceſſity he now lieth under, of conſummating his marriage, of providing for the defence of *Flanders*, and of maintaining the intereſt of the houſe of *Spain*, which in all probability would be ruined, if this peace were not made, the king of *Spain* being generally thought dead, though it be not owned by that nation, nor will be, till they have put things into ſome poſture of ſafety.

SIR *John Lawſon* is come home, but brings news, that beget a ſtrong ſuſpicion in us, that *de Ruyter*, having now victualled his Mediterranean fleet, and ſheathed it, is gone to relieve and fortify his countrymen in *Guinea*; which, if it prove true, will anger us very much, and put things to extremity.

THE Pariſian letter to me hath this note: *Le pape nous refuſe tout à Rome. On craint icy, qu'il ne ſe forme une ligue contre la France, dont la puiſſance donne de la jalouſie: quelques uns veulent, que voſtre roy y doive entrer, à quoy je voy peu de vrayſemblance, la bonne intelligence, qu'il y à entre les deux couronnes, ne faiſant croire le contraire. Le card. de Retz pourra bien aller à Rome, ou nous avons beſoin d'un homme, qui ait autant de lumieres, que luy, et autant de vigueur pour ſouſenir les intereſts de la France, et pour rompre les deſſeins, qu'on pourroit former contre elle.* But I am called away, and can ſay no more at preſent, than that I am,

SIR,

your very humble,

and faithful ſervant,

H. O.

IF Dr. *Wallis* intends to write to Mr. *Hevelius*, and pleaſe to entruſt me with it, I ſhall ſend it with mine, which I am to diſpatch away ſhortly.

London, Oct. 20, 1664.

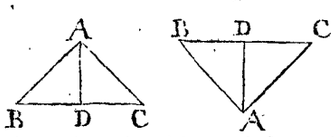
SIR,

YOU will hardly diſpatch faſter for the preſs, than the preſs, by what I ſee, will perform. Three ſheets are already printed off, and I look for the fourth this day; Mr. *Crook* being reſolved not to be behindhand, to whom alſo are already delivered Dr. *Merret*'s experiments, to be forthwith printed in an alphabet apart. I ſend you here encloſed, thoſe enquiries and anſwers concerning *Greenland*, which were formerly preſented to the Society; and they being a part of their ſupellex, I entreat your care for their ſafety. The account given therein, is ſo plain and downright, that it needs poliſhing very much; but as to the matter of fact, I hope it ſuffers nothing by the plainneſs of the deliverer. I owe you many thanks for the medicine againſt violent fluxes; but give me leave to aſk, whether the hot cinnamon and nutmeg may not claim as great a ſhare in the effect, as the cold dead man's *ſkull*? The obſervations recommended by you to the virtuoſi, and read to them at our meeting yeſterday, were very acceptable; and my lord *Brounker* intimated, to have found (and that, as he thought, on the ſame day you did) the mercury in the baroſcope, beneath 29 inches too. I ſuppoſe, Mr. *Hook* will himſelf anſwer your quere, which I acquainted him with, concerning the ſame; as alſo give you notice of the purſued experiments concerning the acceleration of the deſcent of bodies in water. I muſt proceed to let you know the main contents of a letter of Mr. *Zulichem* to Sir *R. Moray*, which was not a little applauded in our aſſembly yeſterday. Theſe are his own words: *Depuis peu l'on m'a envoyé une figure imprimée, qui repreſente une fort belle obſervation de Jupiter, dans le diſque du quel ils ont vû paſſer les ombres de deux de ſes ſatellites, qui paſſoient entre luy & nos yeux, & peu apres ſe deſgagerent du dit diſque. Je n'avois jamais penſé, que cette obſervation ſe pût faire, vû la petiteſſe de ces compagnons, & il faut aſſurement, que leur verres ſoient d'une perfection extraordinaire. Si celui de Reeves de 60 pieds eſt aucunement bon, il ne ſcauroit manquer de deſcouvrir les dites ombres, lorſque ces eclipſes arrivent. J'attends encore le diametre de ce verre, et celuy de ſon ouverture.*

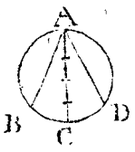
AGAIN:

AGAIN, *Je ne ſcay, ſi* my lord *Brounker aura depuis ſongé à la determination des vibrations de la chorde, eſgales à celles du pendule, que ſcavez; mais je trouvay ſa promeſſe bien hardiè. Cés jours paſſez jè ſuis tombè dans une ſpeculation pas fort ſloignée de celle là. J'ay cerché des pendules ſimples iſochrones à des triangles & autres figures & corps diverſement ſuſpendus; où j'ay rencontrê des propoſitions aſſez plaiſantes, & qui peuvent meſme ſervir à eſtablir commodement la meſure univerſelle, à quoy le dit* my lord *s'eſt eſtudié.*

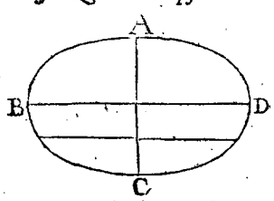
Par exemple, 1. *Je trouve, qu'un triangle rectangle & iſoſcele, come B A C, eſtant ſuſpendu par le ſommet A, ou par le milieu de ſa baſe D, & agité de coſté, eſt iſochrone au pendule ſimple de ſa hauteur A D.*



2. *Qu'un cercle ſuſpendu par un point dans ſa circonference comme A, & agité de coſté, eſt iſochrone au pendule de ¾ de ſon diametre, & de meſme toute portion, comme A B C D, ayant les coſtez A B, A D, eſgaux.*



3. *Qu'une ellipſe A B C D, dont le grand axe a ſon quarré triple de celuy du petit, ſuſpendu par l'extremité du petit axe A, & agité du coſté, eſt iſochrone au pendule A C, & de meſme toute portion coupée par une ou deux paralleles à l'axe B D.*



Si my lord *Brounker goute ces ſpeculations, je vous en envoyeray d'avantage, car j'ay la determination generale pour tous triangles & rectangles, ſuſpendus par un des angles, ou par le milieu des coſtez. Item des cercles ſuſpendus par des filets, comme eſt le cercle B en A: & ce qui a eſté le plus difficile à trouver, la longueur des pendules iſochrones à une ſphere ſuſpendue de meſme par un filet, ce qui ſert principalement à la meſure univerſelle. Car notez, qu'une ſphere grande n'eſt pas iſochrone à une petite, qui auroit le centre egalement diſtant du point de ſuſpenſion. Les mathematiciens en France ont autrefois cherché ces choſes ſans en pouvoir venir à bout, à ce que je voy par des lettres, que j'ay du P. Merſenne, &c.*

THESE particulars I muſt entreat you to communicate to Dr. *Wallis* & Dr. *Wren*, with my hearty ſervice; to the former of which two virtuoſi I am to recommend, from the Society, ſome more papers of Mr. *Horrox*'s, by the carrier to morrow, God willing.

OUR motto being *Nullius in verba*, we intend to examine theſe propoſitions, by making trials ourſelves of the matters aſſerted therein: and the author of them is to be urged to explicate, how he infers his univerſal meaſure from what he affirms here.

SIR, to divert you and myſelf a little, *poſt muſas has ſeveriores*, I ſhall draw to an end, with annexing ſome lines out of the penitential letter of monſieur *Sorbiere*, written to the biſhop of *Laon*, to make him employ my lord *Aubigny* for prevailing with our king, to interpoſe by the king of *France*, that *Sorbiere* may be reſtored from his baniſhment. As much as he depreſſed the chancellor in his printed pamphlet, ſo much does he now extol him in this unprinted letter. For he ſaith—*Facilè alias ſubjungerem litteras, ſi opus eſſet expugnandæ ſummi viri* (meaning the chancellor) *indignationi teli & machinis pluribus, quod de inſigni ipſius clementia ſperare non auſim. Audit enim in patria ſua hominum mitiſſimus; & ſanè unus ille homo Anglis cunctando & parcendo reſtituit rem. Quam laudem minimè conſecutus eſſet, niſi à ſapientiſſimo rege primarium regni munus difficillimis temporibus, exul, cùm de ſalute unuſquiſque deſperaret, nec ambiens, obtinuiſſet. Nimirum ad id operis aptiſſimum oſtendebunt ſuaviſſimi mores, ingenium perſpicax, inſignis facundia, eruditio multiplex, & civilis præſertim doctrinæ uſus & contemplatio. Ad quæ potiſſimum in illo ſpectanda ne ſatis attenderem, leviorum ſtudiorum pulvis, & ſortis meæ tenuitas veluti nubem oculis noſtris objecere. Eram enim, ut verum fatear, totus in admirationem regiæ phyſicorum Londinenſium academiæ defixus; ſcilicet, quod medicorum erat tractabam medicus, & fabrilia faber, in interiora & ſocietatis ſagaciſſimæ arcana nuper admiſſus. Ad alia autem planè cæcutiebam, & ſi quid in diario, quod majoris eſſet ponderis, forte fortuna irrepſit, ab inquinatis fontibus, procul dubio, nec ſatis advertens, hauriebam. Condonabit itaque vir in illo honorum faſtigio poſitus, & cujus fama totum orbem terrarum pervolitat, homini in litterulas ſuas bene affecto, ad phyſicas tantùm auſcultatiores idoneo, ſed* Ἀνθρωπομετρίας, *& ſublimiorum ſcientiarum, ac politices imprimis rudi & ignaro, &c.*

SIR, I want an amanuenſis exceedingly: elſe you ſhould have received the whole letter; which argues as much an abject ſpirit, as can well be, and whereby the writer hath now made himſelf hateful by all perſons of honour; whereas, by his printed book, he appeared only guilty of imprudence and partiality.

IF I could have got any more leiſure, I would have added ſome ſtate news, about our taking of the *Monados*, as is affirmed upon the *Exchange*; but of the danger we are in of loſing *Guinea* by *Du Ruyter*'s fleet, which Sir *J. Lawſon* ſuppoſeth to be gone thither, though many will lay wagers to the contrary; and ſome of thoſe, that grant their being gone thither, are perſuaded, that our people there, by the aſſiſtance and kindneſs of the Blacks, will be able enough to maintain their acqueſt. In the mean time, the Dutch will not now make any haſte to come abroad, but have wit enough to let our victuals and money be conſumed, without action; knowing we come ſhort both of their frugality, and ſupplies of money.

I HAD almoſt forgot to intimate to you, that, meeting yeſterday Mr. *Worſley* upon the *Exchange*, I was deſired by him, to let you know, upon occaſion, that ſome three or four weeks he ſent you a letter of buſineſs, but knows not whether it came to your hands; which puts him, to uſe his own word, to

ſome diſconſolation. But I muſt run away to the agriculture committee, being,

Sir,

your very humble,

faithful ſervant,

H. O.

I CANNOT poſſibly review.

London, Octob. 22, 1664.

SIR,

THE printer calling with inſtances upon me for more copy, maketh me importune you with theſe lines ſo ſoon after my laſt, eſpecially ſince I promiſed him, that he ſhould not ſtay for ſupply. I have this day corrected *G*, and muſt hear, that this ſheet being printed off, they muſt reſt, if no more copy be ſent in the interim.

WE have had an anatome at *Greſham* this day, but my occaſions, that were urgent, pulled me away from the aſſiduity, I intended. In the mean time, I received from Mr. *Beale* an anatomical relation about the manner of cutting the bladder out of the heads of cattle; which, if it be ſo new to you, as it is to me, will perhaps ſurpriſe you. It ſeems, cattle are ſometimes afflicted with a bladder in the brains, cauſing a vertigo in them; and in the taking it out my author ſaith, that the artiſt firſt opens the ſkull in that ſide of the forehead, in which, by a peculiar ſoftneſs, he perceives the bladder to lye, about four fingers breadth, and with a penknife, after he hath cut open the films, which incloſe the brain, ſcrapes off the brain, until the bladder appear; then plucks forth the bladder, with a ſtring, which feeds it, and with an inſtrument for that purpoſe divides the brain at that place, where nature hath made a partition, that is, where the ſpinalis medulla ſhuts to it, and then taketh forth all that half of the brain, in which the bladder grew, leaving the other half as much uncovered and unviolate as poſſibly he can. Which done, he turns the bullock's head ſo upon the horns, that all the water and blood, that was gathered together in the brain-pan, may run forth, and then, with a fine handkerchief on the top of an inſtrument, wipes the brain-pan as clean and dry as he can, and ſo cloſes up the ſkull again. The beaſts uſually (he adds) in a few hours fall to their meat, and recover perfectly.

MR. *Beale* ſaith, that the perſon, from whom he had this account, is an anatomiſt, and in particular perfectly read in Dr. *Willis*'s *Anatome Cerebri*, and that he hath promiſed him more exactneſs and fulneſs of the operation, which he relateth to be by divers diverſely performed, but moſt ſucceſsfully by thoſe, who, in taking away the bladder, do carefully alſo take away the whole lobus, or part of the brain, wherein the bladder lyeth. He obſerveth withal, that the part of the brain taken out hath been, upon ſearch, when the beaſt was ſlaughtered, found regenerate, only of ſomewhat a ſofter and looſer conſiſtence, than the reſt. This, if you pleaſe, with my humble ſervice to Dr. *Willis*. Yeſterday I ſent to Dr. *Wallis*, by the coach, that packet of *Horox*'s, which I threatned him with in my laſt Thurſday's letter. I am called to ſupper, which obligeth me to conclude abruptly,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

THE agriculture committee hath added, upon Dr. *Merret*'s ſuggeſtion, one enquiry more, *viz.* What plants ſeveral grounds produce naturally?

London, Oct. 27, 1664.

SIR,

I FEAR very much, that you, as well as we, have taken pains in vain about the Mercurial conjunction. Our virtuoſi did obſerve, both at *Greſham* and Mr. *Reeves*'s, but found nothing of what they looked for. I hope ſome of our ingenious friends in the American plantations, to whom I ſent notice of it above ſix months ago, have made good obſervations, the conjunction falling out there, about two or three o'clock in the afternoon, if authors have calculated aright.

MORE copy will be extremely welcome to the printer, who will quickly diſpatch Dr. *Merret*'s appendix, which is not above two ſheets. What you mention about the title-page, ought to be ſo; and what you require concerning the conveyance of the ſheets to you, as ſoon as they are printed, you will be readily obeyed in; and I ſhall, God willing, take care of diſtinguiſhing each title into paragraphs, *&c.* And I do not only review the corrected proofs, before they are printed off, but look alſo over the printed copy itſelf, to collect the errata, as the preſs goes on with the book. I did enquire at *Greſham* about the ſtation of the barometer, and was informed, that on Monday laſt it was lower, than the operator had ever ſeen it, the weather of that day being here lowring and in part rainy. The ſaid operator of the Society, by their command, doth keep a diary of the ſtations of that mercury, together with the ſtate of the winds and weather, and hath done ſo ever ſince the beginning of this year, whereof he will be called to an account at the end of it.

THE yeſterday's ſpectacle at *Woolwich* keeping me from attending the Society's meeting, will keep you alſo for once from hearing of their experiments and debates. The chief of the court, and ſome of our chiefs, went to ſee the St. Catharine (ſo they have named the new frigat) launched, and I had curioſity enough to be among the ſpectators, and in the veſſel itſelf, going out of the dock. It is a very gal-

gallant ſhip, of about eighty guns, marked for nineteen foot draught of water, when ſhe hath her full load; of about forty foot over, and an hundred and twenty foot long; ſtanding the king in ſome nine thouſand pounds, as ſhe is now, and being like to coſt him eleven or twelve thouſand pounds more, to rigg her out completely with cables, ſails, anchors, and guns. Sir *John Lawſon* is ſaid to be appointed her commander; the king, queen, duke, and all the great ones, were there, and innumerable people; and the ſubject deſerved ſuch ſpectators. In going down, our company went aſhore by the way, to ſee Sir *William Petty*'s ſhip, which advanceth very well, and will be launched, as they judge, ſix weeks hence.

SIR *R. Moray* and Sir *William* laid a wager about her drawing of water, when ſhe is launched, the latter maintaining, ſhe ſhall not draw above ſix foot eight inches, the other being for more. There is already ſpent upon her an hundred and thirty load of wood, the ſhipwrights making reckoning for twenty more, before ſhe be finiſhed. Her breadth is thirty two foot, whereof fourteen is the ſpace between the two bodies; and her length by the keel is eighty; and the height of the platform from the ſurface of the water is fourteen foot; of which ſhe will draw eleven, when ſhe is fully loaden. I find Sir *William* very chearful, and all his undertakers; and all thoſe, I think, that are well-wiſhers to the improvement of naval architecture, wiſh good ſucceſs to this brave attempt.

OF ſtate news I have little to impart to you this week; yet this I have to ſay, that moſt men think, the war with *Holland* to be unavoidable, and that it will be ſuch an one, as they never yet had. We hear, that the *Dutch* will ſhortly publiſh a manifeſto, to juſtify their proceedings; and we think, we have matter enough, to anſwer them. In the mean time, a Pariſian letter of this week ſaith, *La France n'eſt point ſachée de vous voir animés les une contre les autres, eſperant qu'elle profitera de cette animoſité, & que pendant ce temps là elle eſtablira ſon commerce.* He addeth, *Meſſieurs les Eſtats ne peuvent nullement ſouffrir les actes d'hoſtilité, que Holmes a faits, & qu'il fait tous les jours en Guinee. Et quoy que les vaiſſeaux d'Angleterre ſoyent dans la manche, & que voſtre roy ait dit, que les Hollandois ne pouvoient là paſſer contre ſon gré, ſans choquer les droits de ſa couronne, la flotte Hollandoiſe ne laiſſera pas de tenter le paſſage.*

OF *Germany*, the ſame author ſaith, *La ville d'Erfurt s'eſt rendue à l'electeur de Mayence à compoſition; la lenteur des princes d'Allemagne eſt cauſe de ſa perte. Le parti proteſtant eſt foible, & n'a plus de zele ny de vigueur. La France avec ſon argent & ſes hommes fait trembler tout le monde. Le roy fait faire aſtheur de grandes levees: la conjecture eſt aiſée touchant le deſſein, auquel elles ſont deſtinées.*

BEFORE I conclude, I muſt not omit acquainting you what Dr. *Charlton* affirmed to me of the laſt anatome, that the veins on the right and left ſide of the heart were tranſpoſed; ſo that the vena arterioſa was where the arteria venoſa uſeth to be, and viciſſim; as alſo, that Dr. *Scarborough* had aſſured him, that in the body, diſſected by him at the ſame time, there had been wanting the muſculus pectoralis. He added, that when he and Dr. *Ent* told Dr. *Scarborough* of the ſaid tranſpoſition of the veins, he urged, that the body, already buried, might be unburied again, to give him the ſight of ſo unuſual a ſtructure; which, whether it be done, or not, I cannot yet inform you.

I SHALL endeavour to procure *Peirere's Greenlandia* for you, with all poſſible ſpeed; and I remain,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

THERE was, at our late committee at Mr. *Howard*'s, ſuggeſted by Dr. *Merret* this enquiry more to be added to the reſt: What plants the ſeveral grounds produce naturally? This he thought might not a little conduce to diſcover the nature of the ſoil.

Letters relating to the monſter born at Fiſherton, *referred to in the following Letters of Mr.* Oldenburg.

Sarum, Thurſday Nov. 3, 64.

SIR,

IN my laſt I ſent your honour a brief deſcription of a ſtrange miſhapen birth. I am now enabled to give you a larger account of it, having ſeen it alive, and being preſent and aſſiſtant at its diſſection after death. I have here incloſed ſent your honour the deſcription and delineation of it, and can aſſure you (if I may believe my own eyes) I have written the truth, and ſhall leave it to your honour's judgment, whether you think fit to have it expoſed to the publick view, either in this or any other dreſs. I confeſs the delineation is not ſo accurate, as I could have wiſhed. We are now uſing our endeavours to preſerve the body.

SIR, I am in haſte, and can only at preſent acquaint your honour, that I have received your kind letter, with the box you ſent me, and do at preſent (with the return of my hearty thanks) take leave, remaining,

SIR,

your honour's affectionate friend,

and moſt humble ſervant,

WILL. HANN.

I PRAY, Sir, if this comes to your hand, do me the favour to let me know it.

A Letter

From Mr. Denny *apothecary at* Saliſbury.

Sarum, Nov. 18, 1664.

SIR,

I WAS commanded by Dr. *Turberville* to give you account of the manner of preſerving that ſtrange birth, that was born here with us, this time three weeks; the anatomical obſervations whereof are ſent you in Dr. *Turberville*'s letter (literal miſtakes being to be excuſed, as being copied by a child.) After the bowels were taken out, and the body made clean with ſpunges, I made a ſtrong lixivium with brine, bay ſalt, colocynthides, wormwood, and centaury, with which having well waſhed (and often) the body, for two days ſpace; then in a latten veſſel, framed purpoſely, I put about four gallons of ſpirit of wine, drawn upon myrrh, olibanum, and terebinth, and laid the corps in that, pouring upon it of oil of ſpike and turpentine about ſix pounds of each, having firſt filled the hollowneſs of the corps with ſpunges, mundefied with the ſame ſpirit, and made heavy with powdered gums, to keep the body under the liquor, as alſo the ſculls with the ſame, the brains firſt taken out. Having been about ten days in this liquor, I took out the liquor, and adding more gums, diſtilled it over again, to ſuch a height, as it would all burn away; which hath ſo reſiſted all manner of putrifaction and diſcolouration, as it is gone for *London* for his majeſty's view, and after, for the whole country, that will. I have ſent, by *John Reynolds*, a ſmall glaſs of tinctura ſuccini, another of ſulphuris antimonii, deſiring your opinion, whether they are rightly prepared, and correction, where in an error. I am about a new way, and eaſy, of preparing ſpirit of ſalt, which, if it comes to perfection, I ſhall acquaint you with. So, hoping you will excuſe this ſaucineſs of troubling you, I humbly take leave, and reſt,

SIR,

your very humble ſervant,

HENRY DENNY.

From Mr. William Hann *to Mr.* Oldenburg.

Sarum, Tueſday, Nov. 29, 1664.

SIR,

I RECEIVED yours by the *Oxford* carrier, and underſtand, that my laſt, ſent by the *London* poſt, came ſafe to your hands, and that you have done me the favour to make my name known to your Royal Society. I am glad it was welcome to your honour; yet really both the deſcription and the letter were written in ſo much haſte, that I had ſcarce time to read them over before I ſent them away. I have now more leiſure to give your honour a fuller relation of what I then wrote. Being at the coffee-houſe the ſame morning that this monſter was born, amongſt other diſcourſe, an ancient miniſter being there, told the company the news of a ſtrange monſter, born that morning at *Fiſherton*, and withal ſeemed ſomewhat to wonder, how Mr. *Kent*, the miniſter of *Fiſherton*, could juſtify the baptiſing it with two names, adding, that it was a queſtion to be debated by divines, whether it were to be reckoned as two perſons, and whether it had two ſouls. I then replied, that the divines muſt be beholden to the phyſicians for the determination of it. And from the coffee-houſe I went to ſee it; but could not, without tarrying there ſome time, be admitted to the ſight of it, by reaſon of the multitude of perſons, which flocked thither, where I beheld it, in the lap of the nurſe, by a little fire, having only a linen cloth for its covering, which was taken off at the deſire of every new ſpectator; beſides the room was full of holes, to let in the air, which at that ſeaſon was pretty cold and ſharp. The Friday following, within half an hour after this monſter died, I went to the houſe, to ſee it a ſecond time, and earneſtly deſired the father of it, that he would permit us to diſſect it; but I then found him wholly averſe to it, ſaying, that if he ſhould ſuffer it, he ſhould offend God. The next day (after many ſolicitations by ſeveral perſons) he was prevailed withal to have it done; but would not be perſuaded to have the body preſerved after diſſection, till *argumentum ab utili* prevailed with him. The diſſector was one Mr. *Down*, a ſurgeon in *Cooke-horn*, and a ſtranger in this place, but an ancient acquaintance of Dr. *Turberville*'s (our town ſurgeon being then employed in the country.) I was aſſiſtant to him, and had both hands in the work; and had he not caſually come hither, I had done it myſelf. The diſſection was performed by candle-light, and that in ſuch a throng of ſpectators, that we had ſcarce elbow-room allowed us. There were preſent at the diſſection moſt of out town phyſicians; by name, Dr. *Turberville*, Dr. *Haughton*, Dr. *Whitewell*, and Dr. *Brown*. The diſſection being ended, Mr. *Denny* (an apothecary in this town) by the advice of Dr. *Haughton* and Dr. *Whitewell*, firſt waſhed the body with a lixivium, made of urine, bay-ſalt, colocynth, centaury and wormwood; after that, filled the cavities with bole-armonick finely powdered, and laid it in oil of ſpike, for that night. The next day (as I remember) its pickle was low drawn ſpirit of wine, and its laſt menſtruum was high-rectified ſpirit of wine, drawn off upon myrrh and olibanum firſt diſtilled with oil of turpentine. The diſſection being ended, our town phyſicians (with other company) went to the tavern, where I propoſed, that there might be a meeting of all us phyſicians, the Monday following, to draw up jointly a deſcription of this monſter: but this motion was refuſed; they anſwering me, that we all had ſeen it, and that I might write to my friends, to inform them,

and

and they would do the like to theirs: whereupon (as ſoon as my other occaſions would give leave) I drew up a deſcription of it: but before I had ended it, I had a ſummons from my father, to haſten home unto him, he acquainting me in his letter with his being in a ſad condition; yet, before I would take my journey, I reſolved to ſend your honour a deſcription of the Fiſherton monſter; and being over-importuned, I left the deſcription in the hands of a perſon in this town, which being ſince copied out, is (as I hear) too full of pſeudography; and, to gratify the importunity of others, I wrote out the deſcription of it in Engliſh alſo, which (as I have been told) hath ſince travelled eaſt and weſt. At my coming home, I found my father in a bad condition indeed; for having, about a fortnight before, cut his leg to the bone, and women-ſurgeons applying things wholly improper, and contrary to it, it brought my father into a fever, and his leg to an high tumour and inflammation, inſomuch, that I feared a gangreen to enſue, for ſome parts of his leg looked blackiſh and livid; and my mother ſhe feared death; but (bleſſed be God) by the uſe of good means, his fever hath left him, the tumour and inflammation in his leg are abated, and the wound brought to digeſtion; but that part in the calf of the leg, which formerly looked black and livid, is lately turned to fretting and corroding ulcers. I have been his ſurgeon about three weeks ſpace, and have dreſſed his leg almoſt every day, and am enjoined to be with him again to-morrow. Since my coming back to this town (which was four days ſince) I have taken a review of that deſcription I ſent unto your honour, and have added ſomething in two or three places, which I left out in the former; and although it be not much that I have inſerted, yet it is ſignificant to make the deſcription complete; withal I have adjoined unto it, that other deſcription in Engliſh, and have gotten it drawn forth ſomething more exactly than the former was; all which I here encloſed preſent unto your honour. I ſuppoſe, before this comes to your hands, the monſter will be in *London*; for the father and mother began their journey thither the laſt week, carrying it with them. I thank your honour for the receipt you were pleaſed to communicate to me againſt quartanes and obſtructions. I had the ſame (with very little alteration) imparted to me about five years ſince from a friend: when I uſe it, I add cremor tartari to the infuſion. I heartily wiſh I might any way ſerve your honour, by any communications of mine, in reference to the therapeutical part of phyſick. As to that of the tranſplantation of diſeaſes, I can truly ſay this, that what your honour hath in print, for a cure of the yellow-jaundice, by the party's urine made into a cake with aſhes and buried in a dunghill, I had ſome years ſince imparted to me by a gentlewoman, as a cure for that diſeaſe, where other medicines will not prevail; and (as I have been credibly informed) a maiden gentlewoman of this town hath cured many of obſtinate jaundice, having only the party's water ſent unto her; but what ſhe doth with it, they that told me of it, ſaid they knew not. Your honour (to the beſt of my remembrance, for I am not at preſent maſter of your book, I only borrowing it to read over, and was limitted to a certain number of days for the return of it) mentioneth not any thing in your book of the tranſplantation of agues: I can acquaint you with ſome particulars of that kind: about two years ſince, a near neighbour of my father's had a ſon much afflicted with an ague, for the cure of which I uſed many medicines, in particular, I applied the yarrow-bag to the ſtomach, but all to little purpoſe or effect: at laſt, a woman coming caſually thither, took the boy's urine, emitted a little before the coming of the fit, and made it into a cake with barley-meal, and gave it to a dog to eat; the ſucceſs whereof was this, the boy was freed of the ague, and the dog, which did eat the cake, had a viſible ſhaking ague-fit, as the father and mother affirmed to me (but they both thought it to be witchcaft.) Since that, I have been credibly informed, that a gentleman's ſon, about four miles from my father's houſe, was by the ſame means cured of a tedious ague, the dog, which did eat the cake, having the ague tranſplanted to him. When I was a ſchool-boy, I knew ſeveral freed of warts upon their hands, by taking an elder-ſtick, and cutting as many ſcotches in it, as they had warts, then rubbing it upon the warts, and burying it under a dunghill. As for charms (or ſpells) I have taken the pains to write ſeveral of them, and I think I have many of them yet amongſt my looſe papers; in particular, one for ſtopping of blood, they which uſe it deſiring nothing elſe but the party's name, though at a diſtance. My mother told me, that her mother cured ſeveral, when they have bled almoſt to death, though they have been many miles from her. Another againſt burning or ſcalding (which they call ſingeing out the fire;) another againſt the cramp; another againſt worms; another againſt agues; with which a ſchool-fellow of mine cured ſeveral, and imparted it to me, many years ſince, though I never yet made uſe of it. If your honour think any of them worth the ſending and writing out, you may command them. And, when time will give me leave to look out and tranſcribe that receipt, I uſed ſo ſucceſsfully for the king's-evil, your honour may expect to receive it from me. The biting of a dog hath been known to be cured by the cutting off the hairs of the dog, that grow on his breaſt between the ſhoulders, and applying them to the wound, without any thing elſe applied. Sir, I am enjoined to go down to my weak and aged father, either this day or to morrow, with a purpoſe to return as ſpeedily as I may. If your honour be pleaſed to let me know in a line or two, that this comes ſafe to your hands, and direct it to be left at my lodgings at Mr. *Beach*'s houſe in *Saliſbury*, it will be there received with welcome by, Sir, your honour's moſt humble ſervant, WILL. HANN.

HERE is a report in this town of another ſtrange monſter born in or near *Abington*.

MR. *Whitehead*, a gentleman at *Titherly* in *Hampſhire*, nine miles from this town, had a cow, which lately brought forth a calf with two heads.

I HAVE made a hyſteron proteron in the deſcription, for the brains were diſſected the laſt of all the parts.

Incloſed in the preceding.

MARIA uxor Johannis Waterman ſtabularii apud Fiſherton prope civitatem Sarum, poſt partum laborioſum die Mercurii, Octob. 26. 1664. *circa horam primam matutinam peperit filiam bene figuratam, et in quolibet membro accuratè proportionatam. Semihoræ ſpatio vix interjecto, iterùm parturiens peperit partum monſtroſum cum capitibus duobus, brachiis et manibus quatuor è diametro oppoſitis, cum pedibus duobus, femoribus, natibus, anu, pudendo muliebri circa medietatem corporis prominentibus, ac umbilico ſupra pudendum tres circiter pollices eminente. Horâ quartâ matutinâ ejuſdem diei partus iſte informis baptizatus eſt, cui nomina Marthæ et Mariæ impoſita ſunt; abhinc in diem tertium vixit, in quo temporis ſpatio (per vices) lacte ſaccharato enutritus eſt, plorabat, et per alvum excrementa dejiciebat. Dei Veneris Octob.* 28. *horâ nonâ matutinâ obiit Martha, et paulò poſt Maria.* [*Viraque dum vixit, faciei amabilis, et forſan utraque diutius vixiſſet, ni intempeſtiva viſitantium turba tenellum huncce partum inclementiori aeri expoſuiſſet.*]

Die Saturni, Octob. 29°. *horâ 4â pomeridianâ partes internas ſpectantium oculis ſubjecit culter anatomicus; quibus à cute, muſculis, et ſterno denudatis, viſui ſeſe offerebant,* 1°. *cerebrum cum ſuo cerebello, ventriculis, venis, arteriis, nervis, et menyngibus (utrumque cerebrum pendens uncias viginti cum ſemiſſe.)* 2°. *Cor cum ſuo pericardio in eodem latere utrinque collocatum.* 3°. *Pulmones cum arteriâ trachæâ.* 4°. *Mediaſtinum.* 5°. *Thymus,* 6°. *Diaphragma pervium tum gulæ, tum venæ cavæ, (ſingulis hinc inde partibus debitè conformatis.)* [*Bina omnia bina.*]

Cæterùm anomalia partium in infimo ventre conſpiciebatur, et

1°. *A pyloro utriuſque ventriculi inteſtina (poſt inflationem) ſeſe exporrigebant longitudine ſex pedes ad canalem (ſive ductum) communem, quò utrinque ſimul coaluerunt: à ductu communi ad inteſtinum cæcum longitudo erat pedem circiter unum, ac ab inteſtino cæco ad anum pedes duos.*

2°. *Utrumque hepar (cum veſicâ biliariâ, et venâ portæ) in eodem latere ſitum erat.*

3°. *Ex adverſo jecoris utriuſque ſiti ſunt lienes cum ſuis venulis et arteriis, una cum venis gaſtricis majoribus et minoribus ad ventriculum utrumque excurrentibus.*

4°. *Verſus finem quintæ lumborum vertebræ prope os ſacrum (quod hic incurvatum erat) hinc inde incumbebant renes bene figurati, excepto quod nimis grandiuſculi fuere) carunculas obtinentes papillares, tum venas et arterias emulgentes.*

5°. *A renum infundibulo principium ducebant ureteres, qui inferebantur in cervicem veſicæ, quæ inter inteſtinum rectum et uterum naturali ſitu poſita inveniebatur.*

6°. *In utero diſſecto cernere fas erat ejus fundum, cervicem, vaginam, cum pudendo muliebri, non alia quàm naturæ juſtâ lege confirmatos, præterquàm quod utrique unus communiter inſerviebat. Uterus (cum veſicâ, et inteſtino recto) intra oſſa eorum receptioni deſtinata continebatur.*

7°. *Vena cava cum arteriâ aortâ, omentum, pancreas, et meſenterium, locum et progreſſum ſuum regularem ſervabant.*

Quoad partes exteriores (viſceribus exemptis) tum in Marthâ tum in Mariâ viſæ ſunt, 1. *Coſtæ numero duodecim;* 2. *Sternum tribus partibus compactum cum appendice cartilagineâ;* 3. *Vertebræ colli ſeptem;* 4. *Dorſi vertebræ duodecim;* 5. *Lumborum vertebræ quinque. Os ſacrum cum partibus ſenis vertebrarum æmulis, os ilium, os coxendicis, os pubis ambabus communia fuere.*

Totum corpus longum erat pollices viginti, latum pollices tredecim cum ſemiſſe: ſcil. tranſverſim menſuratum à pedum extremitatibus ad extremum coſtarum.

Corpus hocce conditur, quò a putredine vindicetur, et diutius aſſervetur.

Filia primogenita Eefelet nominata è vivis diſceſſit die Mercurii 9°. *diebus quatuordecim ſupervivens.*

Mater adhuc ſuperſtes et incolumis manet.

London, Nov. 3, 1664.

SIR,

I MUST begin this with the affectionate thanks of the Society for your reſpects to them, in giving them part of ſo conſiderable an account, as that is of the monſtrous birth: they would be very glad to have that double atteſtation of the two phyſicians among their records; and you will farther oblige them in communicating what ſhall more of this matter, concerning either the life or death of theſe double bodies, come to your knowledge. Having *Rueffus* among my books, I looked upon him, and found the allegation, wherein I met with this particular, that the like monſter was anno 1552 born here in *England* alſo, and not far from *Oxford*, of the female ſex, whereof one part was very merry, the other ſad and ſleepy: the difference in the ſhape of that from this of *Fiſherton*, according to the hiſtory, conſiſts only in this; that the former had two legs on one ſide, and a third leg with two toes on the other ſide; whereas the latter hath but two legs, both on one ſide.

DR. *Charlton* being called to an account of his laſt diſſection, and particularly preſſed concerning the tranſpoſition, which I mentioned to you in my former from his own mouth in the preſence of others, who heard him, as well as I, alledge Dr. *Ent* for a witneſs of his aſſertion, was obliged at our yeſterday's aſſembly at *Greſham* to yield, that he was miſtaken; both Dr. *Ent*, who was with us, and Dr. *Scarborough*, having upon the unburying of the heart, and a ſtrict ſearch and examination, found no ſuch tranſpoſition; which diſcovery of the doctor's error, ſpread by his very poſitive affirmations (which made me without ſcruple deliver it alſo to you)

addeth

addeth but very little to his credit. In the mean time the other anatomical obſervation concerning the defect of the pectoral muſcle is confirmed, Dr. *Ent* himſelf upon my particular enquiry aſſerting it with all confidence, and that the perſon, whilſt alive, had not appeared defective in his motions.

WE have been lately examining the teeth of a viper, and ſomewhat of the ſtructure of the reſt of his body; and it hath been found, that the fang teeth, as they call them, being let alone till pretty dry, are hollow, which was perceived by means of ſeveral chains of bubbles appearing within theſe tranſparent hollow teeth, though, whilſt the viper was alive, the obſervers could not perceive the leaſt appearance of hollowneſs, but the teeth then ſeemed perfectly tranſparent conical bodies. Both Dr. *Ent* and Dr. *Merret* affirmed, that having examined the teeth of a rattleſnake (which animal they found very like a viper in all its other parts, and that therefore it was not unlikely, but the teeth of them alſo might reſemble each other) they obſerved, that they were very viſibly hollow, with a ſmall perforation running through the middle of them, from their roots to their tops; and Dr. *Merret* ſaid in particular, that he had proved them ſuch, by thruſting a horſehair clear through them.

THESE obſervations may direct us to find ſomething conſiderable to the purpoſe of the nature of poiſoning, done by theſe animals; which now ſeems to me to conſiſt only in the letting out of a liquor heterogeneous or contrary to the blood and its motion in the body, into which it is conveyed after the vein hath been opened by the ſtinging teeth.

IN the purſuing of our experiments of refraction, we find, that the proportions of the ſines of the angles of inclination to the ſines of the angles of refraction, are near the ſame, *viz.* as four to three. And we find, that as ſpirit of wine ſuffers a greater refraction than common water, ſo oil of turpentine, which is lighter than ſpirit of wine, bears a greater than not only common water, but much greater than ſalt water.

MONSIEUR *Zulichem*, in a new letter, hath given us notice by Sir *R. Moray*, that he hath farther penetrated into the matter of figured pendulums, and found general rules, to give pendules iſochrone as well to ſolid bodies, as to planes; in which he ſaith there occur as hard problems, as any he knows. He acquaints us alſo, to have received from Mr. *Sluſe* of *Liege* a new way of thermometer, (which yet was not new to our virtuoſi here) which is a cane of three foot long, and an inch broad, full of ſalt water, in which ſwims a litte ball of wax, mixed with ſomething more ponderous, to make the ball keep itſelf about the middle of the cane; and that this ball, according to the different degree of heat, riſeth and falls, though not ſuddenly, as the water in the common thermometer; but then, ſaith he, it is not ſubject to the various preſſure of the air, which changeth the other without change of heat. He hath made the experiment of it with ſucceſs.

The ſame gentleman reflecting upon the pretty large aperture in *Reeves*'s longeſt tube, ſuggeſts, that it would be a matter worthy of enquiry, to know, what may be the aperture in each glaſs of ſuch and ſuch a diſtance from the focus, which he judgeth to depend only upon experience. He adds, to have ſeen at *Paris* with wonder a glaſs of 12 foot of *Divini*'s workmanſhip, which did bear an aperture of two inches, Pariſian meaſure. Mr. *Hook* is now making his new inſtrument for grinding glaſſes, the ſucceſs whereof you will ſhortly hear of. But I muſt cut ſhort theſe philoſophical informations, to let you know, what my friend ſent me lately from *Amſterdam*, in anſwer to what you deſired by one of your former, concerning the Turkiſh tranſlation. Monſieur *de Geer*, ſaith he, and I, did rejoice to find your promptitude to propagate the goſpel of our Lord that way; and, if we had any thing printed, we would willingly have ſatisfied your deſire in ſending you ſheet: but the matter is thus; we have but a part of the old teſtament; the reſt we expect with the very next; and then, if God will, we ſhall not fail to fall upon the work. If in the interim (ſo he goes on) we might crave that favour from you or Mr. *Boyle*, as to let us ſee a ſheet of your printing of the new teſtament, thereby to conform ourſelves both in reſpect of the form and greatneſs of the character, you would oblige us very much. This (ſo he concludes) Monſieur *de Geer* deſired me to write, preſenting unto that excellent perſon Mr. *Boyle*, and you, his moſt kind ſalutation.

To add ſomething of political news, I ſhall tranſcribe to you, what came to my hands this week from *France*: *On ne ſonge icy, qu' à perdre les proteſtans. Depuis peu il à eſte ordonné par arreſt du Conſeil, que les temples de Niſmes et de Montauban ſeroient demolis, et qu'il ny en auroit plus qu'un en chacune de ces villes lá. On ruinera bientoſt les academies proteſtantes, et en fera tant d'indignites a ceux, qui demeureront fermes dans leur religion, qu'en fin le nombre en ſera petit et nullement conſiderable.*

Le Pape fait ſemblant d'eſtre faché contre le legat, et de n'approuver pas ce qu'il a fait en France, a fin que cela ne puiſſe nuire au papat, et qu'on ne 's en ſerve un jour. On dit, que la Maiſon de Mr. de Crequy a eſte inveſtie, par ce qu'il y avoit receu un homme, qui avoit aſſaſſiné une perſonne conſiderable.

On s'eſtonne, que le roy d'Angleterre ait trouvé mauvais, que la flotte Hollandoiſe, que eſtoit dans la mer Mediterranée, ſoit allée en Guinnee, ny ayant rien de plus naturel, que de ſe deffendre, quand on eſt attacqué injuſtement et qu'on veut vous ruiner. Il ſemble, qu'on accuſe ſans raiſon les Hollandois d'ingratitude, ne commencans point la guerre, et ne faiſans que ſonger a conſerver ce qu'ils poſſedent, qu'on veut leur oſter ſans aucun pretexte, puis qu'ils offrent de faire ſatisfaction, s'ils ont fait quelque tort aux Anglois. Ils offrent meſme de ſe ſoubmettre au jugement de tel parlement de France, ou de telle cour ſouveraine d'Allemagne, qu'on voudra, pour la deciſion de leur differents. J'ay vu la reſponce,

reſpouce, qu'ils ont faite a Downing, par laquelle ils ſouſtiennent, qu'ils n'ont rien fait contre les Anglois depuis le traité fait avec le roy d'Angleterre, qui a reglé toutes choſes: qu'en cas, qu'ils ayent contrevenu au traité, et qu'ils ayent pris quelque vaiſſeaux, ou fait quelque autre entrepriſe, ils ſont preſts de reparer tous les torts. Apres cela il eſt aiſé de voir, qu'on ne veut point de paix, mais qu'on veut avoir la Guinee, qui eſt a la bienſeance des Anglois. Cependant les Hollandois croyent, qu'il leur eſt plus expedient de courir la riſque d'une guerre, que de conſentir, qu'on leur prenne ce qu'ils poſſedent depuis long temps. Ils hazarderent tout pluſtoſt, que de ne ſe pas deffendre, autrement on ſe mocqueroit d'eux, et ils perdroient leur reputation. Mr. de la Boulaye part la ſemaine qui vient pour aller aux Indes pour la nouvelle compagnie. On ſe remue fort icy pour le commerce, et on a grande envie de l'eſtablir, et d'empeſcher nos voiſins de gagner ſur nous, comme ils ont fait. This ſhews what opinion the French have of our cauſe, and what advantage they intend to make of the war.

SIR, I received on Saturday laſt the beginning of your experimental Hiſtory of Cold, and it is gone to the preſs, whence I hope they have ſent you the ſheets printed off. But what you mention to have ſent by Monday carrier or coach, I have not yet received to this moment; but only the letter, which came unaccompanied with the roll of paper, mentioned in the ſuperſcription of the letter, but not obſerved by my maid, that received yeſterday's letter in my abſence. Your ſervant was with me yeſterday morning, and promiſed me to enquire after it; but I have not ſeen him ſince, nor heard of the roll, which troubles me exceedingly. Thoſe carriers and coachmen are incorrigible; for that letter, which would have coſt in all but two pence, if it had come by the poſt, they took a groat for at my houſe, beſides what you paid for it at *Oxford*. I am,

SIR,

your very humble faithful ſervant,

H. OLDENBURG.

London, Nov. 5, 1664.

SIR,

HAVING been, ſince my laſt, freed of the fear about your laſt papers, I thought myſelf bound to free you alſo of the ſame, into which my late mentioning of their not being come to my hands might juſtly caſt you. They are now very ſafe, and will be within this week in print, as Mr. *Crook* aſſureth, who will alſo take care of keeping them unexpoſed to the eye of a philoſophical robber. As for the Latin of the thermometrical experiments, I know not what inſtinct of mine, ſo well ſuited with your inclination of having it publiſhed by itſelf, made me begin it, as ſoon as the Engliſh thereof was begun to be printed. I hope in a very ſhort time to diſpatch this tranſlation; and I promiſe myſelf the happineſs of ſhortly ſeeing you here, as for many other reaſons, ſo for the ſubmitting the traduction to your review. I am troubled, I cannot get *Greenland* for you; having enquired in very many ſhops, I underſtood at length, in that of Mr. *Alleſtry*'s, that I ſhould hardly find it to be ſold in all *London*.

AFTER that *Religio Medici* is grown ſtale, we have lately printed *Religio Stoici*, which hath ſtrains of wit, and ſome very honeſt and healing maxims for broken Chriſtianity.

THE author no other, but *G. MK.* a moderate churchman, that placeth religion in the contemplation of God, and in ſubmiſſion to him, without quarrelling at innocent ceremonies of decency and order; but that wonders at men, who do legitimate perſecutions, that are uſed by others againſt themſelves by the perſecutions uſed by themſelves, againſt others; and that compareth hereticks and ſchiſmaticks to tops, which, as long as they are whipped, keep foot and run pleaſantly, but fall, as ſoon as they are neglected and left to themſelves.

BESIDES this, there is newly come abroad a certain epiſtle to the ſeveral congregations of the non-conformiſts, by one captain *Robert Everard*, an anabaptiſt before his change, who, being turned papiſt, ſhews the reaſons of his converſion, as he calls it, to the catholick church. Poor man, who deſtroyeth the ſcripture, and having done ſo, will prove the pope and the church by it; but maketh, in the mean time, his new brethren glory in having got one, that was ſo far remote from *Rome*, as an anabaptiſt, to be now a proſelyte of theirs.

THE Dutch uſe much of the fox in aſſerting their cauſe againſt the Engliſh; they bear the world in hand, they will ſubmit all to the arbitration of any prince or ſtate; and they inſinuate into the body of our merchants, that it is only to raiſe a particular royal company; not forgetting to perſuade their own people, that, at the bottom of all, there lieth a deſign to make the prince of *Orange* to domineer over them. But for all this, I believe, they will be outwitted, eſpecially at this preſent conjuncture of affairs, where, a league being in hand, between the pope, the emperor, and *Spain*, againſt *France*, the king of *France* begins to court *England*, and is not at all like to afford any aid to *Holland*.

THERE are new troubles at *Avignon*, raiſed by the new burthens, impoſed by the vice-legat, for a puniſhment to the inhabitants, for their former readineſs to comply with the king of *France*; who, upon the news given him of it by the nuncio in an audience, made anſwer, that he would hear firſt from the pope, what he deſired to have done upon this tumult, before he would pronounce in it.

I HAVE lately offered me a new correſpondence at *Paris*, for all the news and curioſities of *France* and *Italy*, where he affirms to have particular intereſt all over. It is a perſon of

quality, and philoſophically given; which maketh me unwilling to decline the offer, if I had but leiſure and means to entertain it as I ought. He expects nothing for a return, but the communicating to him, what conſiderable books are continually printing in England, whether in Engliſh, Latin, Greek, *&c.* and ſome general account of the progreſs and performances of the Royal Society. He hath already promiſed to ſend me the obſervations, which one of the very beſt philoſophers of *Paris* hath made upon the new book of optick Glaſſes, that are ſo much cried up, as far excelling thoſe of *Divini*. If I may but meet with three or four contributions here in England, I have a good mind to embrace the ſaid overture, believing, I may in a good proportion recompenſe the contributors, and being reſolved to endeavour to be very grateful to the perſons, that ſhall be pleaſed to aſſiſt in the procurement of ſuch. I remain always,

SIR,

your faithful and humble ſervant,

H. O.

London, Nov. 10, 1664.

SIR,

I AM now to redouble upon you the thanks of the Society, for the iterated communications you have gratified them with: you may aſſure yourſelf, that you could not have ſent them to any ſingle private man, that could have had more ſenſe of it than they had; their eſteem being great for all ſuch of their members, that bear the Society, and the concerns thereof, in their mind, as well abſent as preſent. They are unwilling to part with the original of the Sarum phyſician, enjoining me, to offer you a copy of it (ſince your letter ſaith, that haſte would not allow you to reſerve any copy) but yet, in caſe you did require again the reſtitution of the original, then to return it you. I would now, *in omnem eventum*, have ſent you a copy, but could not poſſibly redeem ſo much time, as to do it myſelf; and our amanuenſis is ſo full of matter to be tranſcribed, for our anniverſary election day, for our charter book, now preſently to be made ready for his majeſty's ſubſcription (which is to be done without his coming to *Greſham*) and for clearing a whole year's account, *&c.* that I durſt not charge him with any more. The company wiſhed, that the diſſector of this double-child had more diſtinctly and particularly expreſſed, what veſſels were common, and how they were terminated; which is all the chief matter to be lookt after in this fœtus. Your other obſervation of the perſon with one kidney was therefore pleaſing, becauſe it informed them of two ureters found in that one viſcus. Dr. *Ent* made mention, to have obſerved, that when one kidney was ſtopt, there commonly followed an iſchuria.

IF I am not prevented, I can, in ſome meaſure, for my own private ſhare, requite your anatomical preſents, by letting you know, how, by order of the Society, there was on Monday laſt opened a live dog by Mr. *Hook*, privately, there being only preſent of ſpectators *D. Goddard* and myſelf; and that by means of a pair of bellows (when the thorax was laid quite open, and the whole venter infimus alſo) and a certain cane thruſt into the windpipe of the animal, the heart continued beating for a long while, at the leaſt an hour, even after the diaphragm had been cut away in great part, and the pericardium removed from the heart. And from ſeveral trials it ſeemed very probable, that this motion might have been continued as long as there had been any blood left within the veſſels of the dog; for the motion of the heart ſeemed very briſk and lively, after an hour's time, from the firſt diſplaying the diaphragme; and, upon removing the bellows, the lungs would preſently begin to ſink, and the heart begin to have irregular, thick and convulſive motions; but, upon renewing the motion of the bellows, the heart recovered its former motion, and the irregular ones ceaſed. Though a ligature was made upon all the great veſſels, that went into the lower part of the body, we could not find any alteration in the pulſe of the heart, the circulation, it ſeems, being performed ſome other way. It could not be perceived diſtinctly, whether the air did mix with the blood paſſing to the left ventricle of the heart; nor did we in the leaſt find the heart to ſwell upon the extenſion of the lungs; nor did the lungs ſeem to ſwell upon the contraction of the heart. The phyſicians of the Society were deſired to conſider of the purſuing of this experiment, and of the diſcoveries to be made thereby, eſpecially concerning the communication between the lungs and the heart. I wiſh heartily you would pleaſe to ſuggeſt your thoughts hereof, and impart them with the ſooneſt. We inſiſt alſo upon our experiments of refraction, and found yeſterday, that pure ſalad oil hath a much greater refraction, than any liquor we yet tried, whether common water, ſalt water, ſpirit of wine, oil of turpentine. We intend, God willing, to examine all ſorts of liquors, and that in their various temper of hot and cold, pure and impure, *&c.* We have had lately good ſtore of diſcourſe concerning ſtar-ſhoots, Dr. *Merret* giving us the occaſion, by bringing in ſome of it, which was much clodded, and had a very rank ſmell, which he ſaid, he could not diſſolve by boiling it in water, nor by oil. Some were of opinion, it was a fungus-matter, ſpewed out of the ground, which would have turned into a fungus, but that the time for producing that plant was ſpent: but others were of opinion, that if it were ſuch a matter, it would turn to water; wherefore theſe gueſſed, it might be ſome ſpermatick or abortive matter of beaſts, and eſpecially of

ſheep; confirming their opinion by the obſervation frequently made, that this ſubſtance was not found, but in ſuch places, where cattle and ſheep had been feeding. Others thought, that it might be frogs diſſolved; ſeeing there were ſometimes little bones found in it. Dr. *Merret* was charged to endeavour to procure ſome quantity of it, and to make further experiments upon it.

OUR council is now preſſing to have an end of *Chelſea* college, which, we doubt not, but it will prove good; in which caſe, Mr. *Howard* will be the Society's gardener, without admitting of any competitor; and Dr. *Wilkins* the weeder. The Society did yeſterday chuſe Sir *John Cutler*, an honorary member, and ordered, that he having declared his reſolution to ſettle upon Mr. *Hook*, during his life, an annual ſtipend of fifty pounds, and to refer to the ſociety the direction of the kind of employment the ſtipendiat ſhall be put upon, ſhould have ſolemn thanks returned to him for this ſingular favour, expreſſed to one of their members, and for the reſpect and confidence ſhewed to the whole body; and that Sir *William Petty*, Dr. *Wilkins*, Dr. *Whiſtler*, and captain *Graunt*, ſhould attend the ſaid Sir *J. Cutler*, in the name of the Society, and to repreſent to him, what a ſenſe they have of his generoſity, which they have the more reaſon to value, as being the firſt donation they have been entruſted with, of this kind, and which they hope will procure a leading example to others.

THE biſhop of *Exeter* was yeſterday amongſt us, and did very ſolicitouſly enquire of me concerning your health, deſiring me to aſſure you of his humble ſervice.

THE duke of *York* is now upon the point of going, if he be not gone already, to ſea, accompanied with many gallants, as the dukes of *Monmouth*, *Buckingham*, the marquis *de Duras*, &c. We wiſh only, theſe courtiers may pleaſe the ſeamen, who love neither ceremony, nor imperiouſneſs. We have intelligence, that the Dutch have a fleet in *France*, conſiſting of about three hundred merchant men, laden with wines, brandy, ſalt and corn; which, if they ſhall come home, muſt be ſecured by an armed fleet of their countrymen, paſſing through the Channel, to meet and convey them home; which cannot but cauſe an encounter of the two fleets, and conſequently, as affairs are now heightened, blows. Yet, upon conſideration of all circumſtances, I can hardly perſuade myſelf, that the Dutch will fight, ſeeing they venture their all, whilſt they ſtand ſingle and alone, as, to human appearance, they now do, both *France* and *Spain* courting *England*, and *Sweden* being ready to aſſiſt *England*, much rather than *Holland*; and *Denmark* having not any conſiderable power nor inclination to do them any good. In the mean time, theſe Dutch have made ſure of a very ſubſtantial proviſion to maintain the war, in caſe they be neceſſitated to undergo it, they having taken a courſe to be furniſht with about 800000 *l.* ſterling a year for that purpoſe, as long as the war laſteth; and the people being unanimouſly willing to give the 200th peny; there being alſo order taken, to build every year, for ſome time, a conſiderable number of men of war, of third and fourth rate ſhips, which are thoſe, that do moſt ſervice.

HIS majeſty hath ſent away the lord *Fitzharding* for *France*, as envoy extraordinary, to negotiate buſineſs there of no ordinary conſequences, as every body thinks.

THE king of *France* is reſolved to maintain *Gigeri*, *couſte qu'il couſte*. He ſaith, * * * * * * * * *gloire, & que tout les deſpens, qu'il fait en ce regard la* * * * * * * * * * * * * * * * you have by this time received the printed ſheets; and that you are to impart more copy, as ſoon as conveniently you can. Nothing of the Latin concerning the thermometrical part is, as yet, gone to the preſs; but might now be begun, if I durſt venture it without your review. I have met with ſome particulars in the already printed Engliſh ſheets, of whoſe correctneſs, as to the matter itſelf, I did doubt; but I do not queſtion, but you will meet with them in your reading them over; and if any thing be amiſs, let notice be taken thereof, that it may be put in the errata. I am in haſte,

SIR,

your faithful humble ſervant,

H. O.

London, Nov. 17, 1664.

SIR,

MY not returning you a copy this week for the late original papers, you have been pleaſed to leave ſo readily among the records of the Society, (which civility I am again to acknowledge to you in their name) would trouble me much, if this conſideration did not eaſe me, that you would take in good part ſome little delay, which the preſent croud of employments, put by the Society upon their amanuenſis, indiſpenſably requires. For he being to enter many things into their books, before the approaching ſolemn day of election, and to write fair their charter, laws, liſt of fellows, *&c.* and to prepare a book for his majeſty's inſcription, and many other things and tranſcripts, that bear no delay, lying upon his hands, it was not poſſible for him to make a copy for you this week, which yet, I hope, ſhall be ready the next. I am ſorry the diſſector of the double child did not put his name to the account he gave of the operation; and we muſt contrive ſome way or other, to have it yet done, for the more authenticneſs of the relation, now it is be recorded by a Royal Society of ſevere philoſophers. I rejoice to find anatomical experiments and obſervations ſo well purſued, both here and at *Oxford*, perſuading myſelf, we ſhall at length find out more for the uſe of reſpiration

reſpiration, and the account upon which it is ſo abſolutely neceſſary, than ever was done. Will it not be made out at laſt, that Life is a kind of ſubtil and fine flame? to which the air muſt be applied, to keep both it in motion, and the blood, wherein it reſideth, which thence looks florid and ſprightly, when the air having been mingled with it, as it were, *per minima*, paſſeth along with it into the left ventricle of the heart, and thence into the arteries; after which, when the blood returns into the veins, it there begins to change its countenance, and looks dull and torpid, till it come again to the place, which can revive it. Thoſe particulars, which your ingenious gentleman promiſed you an account of in writing, I muſt put you in mind of, and beg a ſight of them for our Society, who is much pleaſed with whatſoever comes from you, it being conſtantly of conſiderable weight. They proſecute diligently the experiments of refraction, and find, by what they have already done, cauſe to think, that the ſimpleſt liquors have the leſſer, and thoſe, that conſiſt of ſeveral and differing parts, the greater refraction. We tried yeſterday with hot and cold common water, and they had an equal refraction; and then with ſalt water, whoſe refraction was two degrees greater than the former waters. Our preſident did urge, that both fixed and volatile ſalts ſhould be with ſeveral degrees, or quantities rather diſſolved in water, to ſee how the refractions vary, and thence to learn by the degrees of refractions the quantity of ſalt contained in liquors. We ſhall, God willing, proceed to all kinds of oils, wines, coloured and turbid waters, aqua regis, aqua fortis, milk; and, if we can contrive it, to the refractions of ſmokes and ſteams.

MY Lord *Brouncker* acquainted the company yeſterday, that he finds by ſtrict obſervations, for a long time continued, that by his barometers he knows as well the temper of the air, for its heat and cold, as for its preſſure and gravity, affirming, that the air had been very well exhauſted in them.

MR. *Howard* produced a ſubſtance, taken out of the grave of a man, that had been dead thirty years, and was in a manner all waſted, but that a piece of fat remained about the place of his belly, of which his preſent was a ſmall portion, which, being put upon the fire, burned and ſmelled like fat. We had a couple of your Oxonian doctors of phyſick amongſt us yeſterday, Dr. *Millington*, and Dr. *Needham*, the latter whereof related to us, how that at *Oxford* they had by blowing into the receptaculum chyli continued the pulſe of the heart, without (if I miſtook not) the exerciſe of the lungs. We did amongſt other things appoint a meeting on Monday next with ſome merchants of the *Eaſt India* company, upon information received, that ſome of them having been in the *Eaſt-Indies* themſelves, and being very well able to anſwer to our enquiries, drawn up for theſe parts, had declared a great readineſs to ſerve the Society with what they knew of thoſe particulars. Our preſident intends to be there himſelf, and we ſhould all be glad to have you one of the number: but this is much more a matter of wiſh, than hope. I had on Tueſday laſt the firſt fruits of my new correſpondence with the Pariſian gentleman, I lately mentioned to you. He ſent me a pretty big packet, containing both pamphlets and books, all polemical, both in divinity and philoſophy. Thoſe of divinity concern the conteſt betwixt Janſeniſts and Jeſuits, whereof the former fall upon the latter without mercy, and ſeem to me to do them more miſchief, than ever was done to them by the whole body of proteſtants ſince the reformation. One piece of this kind is called, *Examen de la lettre circulaire de l'aſſemblée tenue à Paris*, Oct. 2, 1663. which layeth the pope's infallibility, ſo much contended for by the Jeſuits, upon mere political grounds, as flat as proteſtants could do. Another is entitled, *Les pernicieuſes conſequences de la nouvelle hereſie des Jeſuites, contre le roy et contre l'eſtat.* This muſt needs make all kings, princes, and ſtates, more afraid of this order and the ſeed they ſow, than ever they were. The third is, *en vers burleſque*, under the name of *Onguent pour la brulure, ou, le ſecret pour expeſcher les Jeſuites de bruler les livres.* The philoſophical pieces are two; one is medicinal, called, *La phyſique d'uſage, contenant, apres un diſcours general ſur la medecine, la deſcription du corps humane: puis l'explication des maladies et de leur remedes, tirée des principes de la mechanique et de la philoſophie de Mr. Deſcartes, par meſſieurs d'Orlix et Plempius.* In which I find the latter part to be little elſe than a tranſlation of that Latin piece, which about a twelvemonth ſince I received from *Paris*, and gave you a view of. But the other book is a very bold piece, undertaking to refute *Paſcal*'s little book *de la peſanteur de l'air*, and with him all his partiſans, as he calls them. I had ſent it you by the next carrier, but that the Society yeſterday deſired their preſident to peruſe it, and give them his ſenſe thereof. I am of opinion, the author will rather beget ſport, than trouble to intelligent readers, who will hardly hold ſmiling at the title of his book, which is, *La verité du vuide contre le vuide de la verité, ou l'on decouvre la veritable cauſe des effets qui juſques icy ont eſté attribuez a l'horreur du vuide, contre l'erreur, qui les attribue a la peſanteur de la maſſe de l'air: par le P. Charles Bourgonis, religieux Auguſtin, a Paris*, 1664. He ſeems to be a great aſſertor of vacuum, affirming, that nature is ſo far from abhorring it, that ſhe loves and cheriſhes it, and can by no means be without it. I doubt he hath a great deal of it in his head. He is very poſitive, that all the phænomena, which uſed to be aſcribed to the fuga vacui, come from nothing elſe, but *de la difficulté de rarifier les liqueurs (y comprenant l'air) qui eſt plus grande* (ſaith he) *ou moindre, ſelon la diverſité de leur natures: et 2. de la tres intime union des corps fluides avec les ſolides, et des fluides avec des fluides, de ſemblable ou de diverſes eſpeces, quand ils ſont contigus, et qu'ils ſe touchent*

touchent immediatement. And ſo he makes all the things, which the vulgar hath hitherto attributed to the abhorrency of a void, and monſieur *Paſcal* to the weight of the air, the effects of rarefaction. He names you often in the book, and refers to your experiments, as they have been alledged by *Paſcal*; and he maketh it his buſineſs to maintain, that though the air have weight in itſelf, yet it actually weighs not, becauſe it is faſtned and glued to the heavens, *qu'il touche et eſt uni à la premiere ſphere.*

SIR, I muſt not conclude without telling you, that I have delivered your letter to Mr. *Evelyn*, and acquainted Mr. *Crook* with your orders, who tells me, that he diſpatches the printed ſheets away as faſt as he can by coach or carrier. He ſaith withal, that his preſs hath ſtood ſtill this whole week; and he hath given to Mr. *Hook* thoſe ſheets, that mention the ſchemes, which will be done according to your deſire. The Latin tranſlation of the preliminary Diſcourſes is near an end; and, ſince you give way to it, ſhall go to the preſs immediately. I am called upon to conſider with ſome company, of a roll of papers ſent to me by Mr. *Beale*, about the aſſerting and eſtabliſhing the reputation of the Society, both at home and abroad; and I am ſure I ſhall eaſe you by ſaying no more, ſince I have ſcribbled ſo much, than that I am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

I HUMBLY thank you, Sir, for your Turkiſh ſheet, and ſo will, I am confident, meſſieurs *de Geer* and *Serrarius.*

London, Nov. 19, 1664.

SIR,

THOUGH I gave you the trouble of a letter but very lately, yet could I not omit to haſten this after it, to acquaint you, that the ſequel of the Hiſtory of Cold is ſince my laſt come to my hands, and at this very time under the preſs, which will, we hope, bring the reſt hither as ſoon as may be. I have alſo delivered to another preſs, the beginning of the Latin tranſlation of the thermometrical Paradoxes, which will, I believe, be wholly diſpatched in a fortnight, and does therefore deſire your directions for a title, and, if you think it neceſſary, ſome preface. This was the errand of this ſcribble; but ſince I have begun, I am reſolved not to end with the beginning, but to give you the ſum of what the French poſt brought me ſince Thurſday. It is no leſs than the total loſs of *Gigery*, and of 48 guns with the king of *France*'s arms upon them, the Moors having with ſuch a number and vigour aſſaulted it, that the French were not able to bear up againſt them. This doth ſo nettle the king, that he is reſolved both to puniſh the authors of the miſcarriage, and to attempt another place with 20,000 men the next ſpring. *At multa cadunt inter calicem ſupremaque labra.* This is a conſiderable check to his fierceneſs, and is like to do him more miſchief than perhaps he is aware of.

THE queen of *France* is brought to bed of a daughter of eight months, which hath the ſhape of a Moor, and ſomewhat of that complexion; whence that king is ſo enraged, that he hath baniſhed all the Moors, dwarfs, and monkies, from his court, the queen having a little Moor about her, that ſeems to have ſo tainted her imagination, as to give ſuch a colour and ſuch features, that reſemble him. In the mean time the queen hath been very dangerouſly ill, and was given over by the phyſicians; but that madam *de Fouquet* came and preſented a medicine, which ſhe exalted highly as ſuch an one, that would infallibly cure her, by bringing away the ſecondina, which had caſt the queen into ſuch convulſions, as made her caſe appear deſperate. My letter ſaith thus: *Les medecins l'examineront, et quoy qu'ils ne ſoyent pas ordinairement favorables aux remedes, qu'ils n'ont pas ſuggeré eux meſmes, neantmoins ſoit qu'ils le jugeaſſent innocent, ou que par un reſte d'amitié pour monſieur Fouquet ils le vouluſſent favoriſer, ils trouverent bon, qu'elle donna ſon remede, qui fit de ſe admirables effets, que la reyne vuida entierement l'arrierefais, et fut extraordinairement ſoulageé, en ſorte qu'elle dit au roy, qu'elle ne tenoit la vie, que de madamoiſelle Fouquet. Les amis de ſon mary eſperent que cela produira quelque bon effect pour luy.* I am,

SIR,

your faithful humble ſervant,

HENRY OLDENBURG.

London, Nov. 24, 1664.

SIR,

WHAT was deferred to this week, you will find performed by the papers annexed; but how we ſhall get Mr. *Hann*'s name of his own writing to his own account, I know not; unleſs he be pleaſed by your ſolicitation to ſend us another draught of the ſame ſigned with his own hand. The Society always intended, and, I think, hath practiſed hitherto, what you recommend concerning the regiſtring of the time, when any obſervation or experiment is firſt mentioned; and they upon this occaſion have declared it again, that it ſhould be punctually obſerved: in regard of which Monſieur *de Zulichem* hath been written to, to communicate freely to the Society, what new diſcoveries he maketh, or what new experiments he trieth, the Society being very careful of regiſtring as well the perſon and time of any new matter, imparted to them, as the matter itſelf; whereby the honour of the invention will be inviolably preſerved to all poſterity. I know not, whether

ther as I intended, and was commanded, deſire your favour of acquainting Mr. *Hann* with the Society's being very well pleaſed with his curious diligence in his late diſſection and obſervation, as they ſend you their hearty thanks for that communication. If I have forgot it, I beſeech you to receive it now, and to take notice of what I have hinted of reſpect to Mr. *Hann*. Indeed I ſhall not have ſo much time left, as to read over the amanuenſis his tranſcript, if I ſhall ſay all, what I have to ſay to you at this time. No account yet of the Florentine experiments, however they were promiſed me to be ſent with the packet received. My new correſpondent, I hope, will be more punctual, if I can but be ſo to him. He hath given me notice by his laſt, that they have a deſign in *France* to publiſh from time to time a journal of all what paſſeth in *Europe* in matter of knowledge, both philoſophical and political: in order to which they will print, as he ſaith, (to give it you in his own words:) 1. *Tous les livres, qui ſe ſont imprimés depuis l'annee* 1664. *et ceux, qui s'imprimeront à l'advenir, ſoit qu'ils ſoient imprimés de nouveau, ou qu'ils ſoyent reinprimez ſur quelque ancienne edition.* 2. *Toutes les experiences et nouvelles deſcouvertes, qui ſe font dans tous les arts et toutes les ſciences, phyſique, aſtronomie, chymie, medicine, &c.* 3. *Le nom et les qualités des perſonnes, qui excellent en toutes ſortes de ſciences et arts, les ouvrages, qu'ils ont faits, et ceux, qu'ils ſe propoſent de faire; la mort de gens de lettres de quelque reputation; les choſes principales de leur vie avec le catalogue de tout ce qu'ils auront donné au public, pour en pouvoir compoſer l'eloge.* 4. *Les academies et bibliotheques plus celebres, et ce qui ſe trouve de rare et de beau dans les cabinets des perſonnes curieuſes.* 5. *Les conteſtations, qui ſurviennent entres les ſcavans, et les belles queſtions, qui ſe peuvent preſenter devant meſme qu'on en ait rien eſcrit.* 6. *Les deciſions les plus notables des tribunaux eccleſiaſtiques et ſeculiers. Enfin, tout ce qui ſe paſſe d'extraordinaire dans la republique des lettres, et qu'on jugera digne de la curioſité de ceux, qui font profeſſion d'eſtude.*

IN order to the execution of which deſign I am ſolicited to contribute what I can concerning *England*, and what is found there as to excellent perſons, things, books; being promiſed to be paid in the like coin from *France*, of what paſſeth there and in *Italy*, concerning thoſe particulars. I am very unwilling to decline this taſk; but yet how to undertake it, being ſo very ſingle, and having ſo much already charged upon me, I do not yet know. But I muſt remember my motto, *Providebit Dominus.*

WE had yeſterday at our aſſembly a noble appearance, and as much life as I ever ſaw there; and no queſtion this Society would prove a mighty and important body, if they had but any competent ſtock to carry on their deſigns; and if all the members thereof could but be induced to contribute every one their part and talent, for the growth, and health and welfare of their own body, which, methinks, is one of the moſt reaſonable things in the world, and conſequently ſhould be eaſy to be perſuaded to thoſe, that make profeſſion of reaſon and virtue. Our liſts for Nov. 30. were ſent abroad on Tueſday laſt; and we are ſorry, that that, which was deſigned for you, could not find you at *London*, nor *Chelſea*. There have been lately elected into the Society, Sir *Robert Atkins* the younger, Mr. *Godolphin*, Mr. *Bagnall*, Mr. *Thyn*, Mr. *Hoare* comptroller of the Mint, Mr. *Woodfort*, Sir *John Cutler*, (Mr. *Hook*'s benefactor) and yeſterday the preſident propoſed Mr. *Harvey*, the queen's treaſurer, for candidate, inſomuch that we are now full 150 men. Mr. *Sprat* intends to begin next week to print the Hiſtory of our Inſtitution, which hath been peruſed by lord *Brounker*, Sir *R. Moray*, Dr. *Wilkins*, Mr. *Evelyn*, and others; but we are troubled, that you cannot have a ſight of it, before the publication. I ſee the author hath divided his diſcourſe into three general heads: the firſt giveth a ſhort view of the ancient and modern philoſophy, and of the moſt famous attempts, that have been made for its advancement; that by obſerving, wherein others have excelled, and wherein they have been thought to fail, it may the better be ſhewn, what is to be expected from our new undertakers, and what moved them to enter upon a way of enquiry, different from that, on which the former have proceeded. The ſecond conſiſts of the narrative itſelf, and out of the regiſters and journals of the Society, which the author hath been permitted to peruſe, relateth the firſt occaſions of their meetings, the encouragement and patronage, which they have received, their patent, their ſtatutes, the whole order and ſcheme of their deſign, and the manner of their proceedings. The third trieth to aſſert the advantage and innocence of this work, in reſpect of all profeſſions, and religion itſelf; and how proper, above others, it is for the preſent temper of the age, wherein we live. I muſt confeſs, the ſtile is excellent, even, full, unaffected; but I know not, whether there be enough ſaid of particulars, or, to ſpeak more truly, whether there are performances enough for a Royal Society, that hath been at work ſo conſiderable a time.

I FIND I have digreſſed, I know not how, from what I would have mentioned above, when I hinted to you the vigour of our yeſterday's meeting. I would have acquainted you with the ſeveral ſubjects of our entertainment; as 1. of the account, which our preſident brought in out of Iceland, *viz.* that the mountains of ice are generally ſuppoſed to have their firſt matter from the freſh water falling from the mountains of *Greenland*, and being frozen before they come into the ſea, they then receive the impulſes of the ſalt water, which being broken by its own violence, is ſoon frozen to the firſt freſh cruſt, which by northern winds are driven down to Iceland, and by reiterated combats with the waves augment their bigneſs to thirty five, and ſometimes forty fathoms beneath the water. I am certainly informed (ſaith the writer) by a very ſkilful and honeſt maſter, that he obſerved

ſerved one of theſe mountains of ice to ground, and ſoon after upon the ſide it floated away, and he went directly to the place, and ſounded, and found it thirty five fathoms; and another, by the ſame experiment, had found it in another place, forty fathoms. Theſe iſlands, he adds, do yet receive a farther increaſe from the ſnow, which being melted by rains, and then frozen again, do make the upper part very hard, and compact, and in height above the water eight, ten, and ſometimes twelve foot. As to the tides, he ſaith, that they riſe and fall unequally in the ſeveral parts, as here in *England*, but very ſeldom above three foot, for the moſt part two, or two and a half: the ſpring and common tides happen much about the ſame time as they do here. Meats boiled or roaſted retain that accidental heat there, more than twice as long as here. The magnetical needle varies unequally, declining faſter (but ſtill unequally) as they come near the land. There is no wood, which grows there, except birch, which ſeldom grows big enough to be ſerviceable for building; but they are in ſome meaſure ſupplied with good fir trees, blown upon their coaſts, but not any ſatisfaction hath been given, from whence they come. The bodies of the ſun and moon ſeem much larger there, than here: the moon hath appeared within fourteen hours after the change.

THE nations are ſtrong, healthy, and very kind, though unhewn and dirty. Turf is their common firing, and the cover of their houſes. Whey, when it is ſour, is their beer; and ſtockfiſh is their bread; and beef and mutton (if it dye alone) is their food; for then, they ſay, it is of Chriſt's own killing, and ought to be reckoned in the number of delicacies.

ANOTHER letter in Latin and Greek, a great part whereof conſiſts in Icelandian compliments, mentions theſe particulars: *Nullus pinguis liquor gelu apud nos corripitur, neque ſpiritus vini: gelu, ubi maximè, tres pedes penetrat terram, ſæpiſſimè duos. Fontes calidi hîc multi, adeò ferventes, ut ad dimidium horæ caro bovina, ollæ cum frigida aqua impoſita, ſatis decoquatur, nedum ut ſufficiat ad deplumandam avem. Agricultura apud nos nulla, vaccæ fœno hyeme vivunt; equi, oves, gramine, quod à nive liberum eſt ſæpiſſimè.* After theſe letters, we had two experiments of refraction made upon oil of turpentine and ſallet oil, whereof the former, (the angle of inclination being 30.) had its angle of refraction 16. 50'. the latter (at the ſame angle of inclination) had an angle of refraction 46. 29'. This occaſioned a great deal of good and quick diſcourſe, and brought in a liſt of experiments to be tried of refraction; as to examine the refraction anſwering to ſeveral degrees of inclination. To examine the comparative refraction of ſeveral liquors to common water; as of all ſorts of oils made by expreſſion or diſtillation, all kinds of ſaline and ſpirituous liquors; and to do this with ſeveral degrees of inclination. To examine, how much the refractions of liquors are altered by mixing of ſeveral liquors together, that do, as it were, penetrate each other; as having examined the refraction of oil of vitriol and common water each of them apart, to mix them together, and to find what is the compounded refraction, by mixing alſo of acid and ſulphureous liquors, *&c.* To examine further the refraction of liquors, wherein hath been diſſolved a determinate quantity of ſome kind of ſalt, as of ſea ſalt, common ſalt, ſal-petre, alum, vitriol, alcali, tartar, *&c.* Again, to examine the comparative refraction of a liquor, when a greater quantity of the ſame ſalt is diſſolved in it, and when a leſs; as alſo the refraction of a liquor, when two or more liquors have been diſſolved in it: item, the refraction of ſeveral liquors, wherein colours have been diſſolved. And then to proceed to examine the refraction of all kinds of ſolid bodies, as diamonds, cryſtal, glaſs, ice, gummous and reſinous ſubſtances, horn, arſenick, and all other tranſparent bodies. Item, the refraction of ſeveral coloured glaſſes, and to find, by what means the refraction of glaſs may be augmented or diminiſhed; and to examine alſo the refraction and ſtructure of the ſeveral humours and parts of the eye; and to obſerve the refraction of the air of ſeveral denſities; and finally to examine, what will be the beſt figure and the beſt material to make dioptrick lens's. You ſee, Sir, what a field we have here before us. This being over, an account was brought in of a viper diſſected by Mr. *Hook*, according to a former order of the Society; the notable particulars whereof, becauſe I gueſs the diſſector himſelf will acquaint you with, I muſt not anticipate. Only this I cannot hold to ſay, that the lungs were a very curious and admirable workmanſhip, being blown up by a ſmall pipe; extending themſelves from the throat beyond the gall, and being nothing but one continued bladder, nôt ſeeming to have any kind of partition or parenchyma, but only to conſiſt of a very thin ſkin, whereof the upper part looked almoſt like a net, but the under part like a film, as clear as the bladder of a carp, without any kind of veſſel or muſcles in it, though examined by a microſcope. This experiment will, and ought to be proſecuted, and may conduce much to the enquiry about reſpiration.

OUR preſident gave, after this, an account to the company of the Anti-Paſcalian book, which I ſhall ſend you by the firſt coach, which will be to morrow. His lordſhip obſerved, that he did not ſo much refute *Paſcal*, as bring in another hypotheſis; whereby he could indeed ſolve all the phænomena, but, as he thought, not ſo rationally, as it was done the other way; putting all upon the ſtreſs of rarefaction, and the motus nexûs, an hypotheſis inconceivable to conſidering men. His lordſhip was very ready to comply with what you deſired in your letter, and drew up, with his own hand, as you ſee the annexed account about the barometers. He was earneſt with me, not to forget the preſentment of his humble ſervice to you; and he added ſuch ex-

preſſions concerning the eſteem his lordſhip hath for you, that no man can have greater: and when upon your return hither you ſhall know all, you will then ſay, I have ſaid too little of it now. I am not able to read over this long rhapſody, no more than the tranſcript of our clerk, leaving all to your goodneſs to pardon the faults of,

SIR,

your very faithful humble ſervant,

H. OLDENBURG.

SIR, I pray be pleaſed to hint to me, whether the ſame preface will ſerve in differing languages, for the Latin thermometrical, and for the Engliſh both thermometrical and hiſtorical Treatiſe.

HIS majeſty let the parliament know this day, how ill his neighbours had proved ſince he ſaw the parliament laſt; what preparation he had made to reduce them to reaſon, and the charges thereof (800,000 *l.* ſterl.) and his happineſs of doing it upon his own credit; together with the aſſurance he had, that they would do quickly, what they had promiſed to do, when they voted to aſſiſt him with their lives and fortunes in the undertaking of the war, and the carrying of it on; and, that he was reſolved to make no peace, but upon a firm bottom of the nation's honour and welfare to that purpoſe.

London, Nov. 26, 1664.

SIR,

YOUR laſt came very ſeaſonably, and all will be rectified and filled up according to your directions and ſupplies, both in the Engliſh and Latin. I hope, you will diſpatch to us all the remainder, belonging to the hiſtory of Cold, before the week's diverſion comes in; our Society having already, by the late froſt, excited one another to the proſecution of experiments of freezing, and mention having been there made of your hiſtory, that is a printing, for variety of excellent materials to work upon. I do here incloſe my draught for the publication of your thermometrical preliminaries; wherein I doubt, I come far ſhort of what ſhould be ſaid, and particularly about the communication of the ſealed thermometer, and the barometer; concerning which, ſince I have not the perfect and certain knowledge of their firſt inventor, I have minced, as you ſee, the intimation, I give of it; entreating you, that you would oblige me, by your private pen, to make ſuch additions and alterations, as you ſhall find neceſſary, and ſo to ſend it back ſpeedily, I having no copy of it.

I SEND here annexed, his majeſty's ſpeech, which I took from Mr. *Herringman* for you, thinking you would be very well pleaſed, to read, with the firſt, ſo kingly and ſo prudent a ſpeech; which had ſo great an effect, that yeſterday, which was the very next day after, the parliament voted for the king and the carrying on of the war 2500000 *l.* to be raiſed by aſſeſſments. If our neighbours could any way handſomly recoil, they would do it with all their hearts; and their ambaſſador never had a more uncomfortable ſupper, than he had yeſternight, when the news was brought him of ſo mighty a vote, the like was never given for any Engliſh king. It is thought, the ſword will not be put up now, till his majeſty be fully poſſeſſed of the dominion at ſea, and the diſpoſal of trade. It may produce at laſt that coalition, which hath been formerly deſigned by *England*. That righteouſneſs may be the foundation, and that proteſtantiſm may receive no diſadvantage, and that at length a good peace may cement all again, is the hearty wiſh of,

SIR,

your faithful humble ſervant,

H. O.

SIR, I humbly thank you for your preſent of *Stillingfleet*'s new book. Since you are pleaſed to make it by way of a dilemma, I take the freedom of embracing that part of it, which is moſt for my advantage, thinking, I may make a good uſe of it, as a Pariſian.

London, Dec. 3, 1664.

SIR,

IN hope, that the time of the reſpite, lately reſerved to yourſelf, will be near expired, when this ſhall come to your hands, I made no great ſcruple to overtake it, eſpecially ſince the chief occaſion of this letter is the incloſed, which containeth an account, that you and your Chriſtian friends will not be diſpleaſed with. It came from *Amſterdam* to me, by a ſpecial friend, ſince my laſt to you; but it ſeems, that at that time, when it was written, my letter to our correſpondents there, which was a cover to the printed Turkiſh ſheet, I ſent thither by your favour, was not yet come to their hands. It appears by the beginning of this copy of *Warnerus*'s letter, that he intends to tranſlate the new teſtament, as he hath done the old: wherefore it fell out very opportunely, that we diſpatched to *Amſterdam* a pattern of what is done here in that particular, perſuading myſelf, that they will with all ſpeed tranſmit the notice of it to *Conſtantinople*, to the end, that the ſaid *Warnerus* may not *actum agere*. I do intreat you, Sir, that you would oblige me, to have this Latin letter ſpeedily tranſcribed, if you ſhall have further occaſion of it, than to read it, that I may have it returned the next week to me, who had no time at all to take another copy of it.

MR. *Crook* was extremely ſurpriſed, when I read to him, what you ſaid in your laſt about the ſlowneſs of ſending you the printed ſheets of your book, proteſting to me, that he had ſent you all on Monday laſt, what was then printed off; and aſſuring, that on Monday next you ſhould not fail to receive two ſheets more, which would make in all ſeventeen

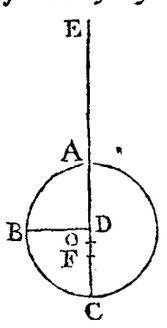
ſheets,

ſheets, if I miſtake not, the laſt ſheet being *S*, though I have at this time *T* alſo by me, to review it, to print it off on Monday next. I perceive by Mr. *Crook*, that Dr. *Merret* thinks, you will, both in the title of the book, and in the preface, take notice of his appendix; to which I made anſwer, that I did not doubt, but you would do ſo.

I CONCEIVE it neceſſary, if your leiſure would permit, to give yourſelf the trouble, in the peruſal of the printed ſheets, ſent you of your hiſtory of Cold, to ſet down the miſtakes, that will occur here and there, notwithſtanding all the care, that hath been taken in the correcting. For, though I have marked ſome of them (which yet are but very few) yet there are ſome paſſages, which I did not well ſee the ſenſe of, at the leaſt, it ſeemed imperfect to me: and they were, p. 48. unto the word *Beſides*; item, p. 239. N^a 3. lin. where a word ſeems wanting to determine the meaſure of the *Bolthead*; item, p. 83. I deſire to know, what is underſtood by *unfreeſing liquors*; whether ſuch, as do not cauſe, or thoſe that do not ſuffer congelation? item, p. 266. Q. whether there be not a word omitted, or miſwritten in N° III.

I SHALL ſay no more for this time, than that Mr. *Zulichem*, in a late letter of his to Sir *R. Moray*, hath given us this account, concerning an univerſal meaſure, which I beg may be even communicated to Dr. *Wallis*, with my humble ſervice, and whereupon I expect both your ſenſe. Theſe are his own words:

Pour ce qui eſt de la regle de my lord Brounker des pendules iſochrones, qu'il a pris la peine d'eſcrire dans le billet, que vous m'avez envoyé, elle s'accorde avec la miene en ce, qui eſt du mouvement de largeur des figures planes, mais ne s'eſtend pas à l'autre mouvement, que j'appelle lateral des meſmes figures, ou il y a beaucoup plus de difficulté, ny auſſi aux mouvements des corps ſolides, ou il y en a encor d'avantage. Vous m'avez deſia communiqué autrefois ce qu'il avoit determiné pour la meaſure univerſelle. Mais pour n'eſtre point obligé à une certaine proportion de grandeur de ſphere à la longueur de pendule, il eſt utile de ſcavoir le centre de vibration d'une ſphere pendue à quelque longueur de fil que ce ſoit, lequel centre je mettray icy comment ſe trouve. Soit la ſphere



A B C, dont le centre D, pendu au filet AE, attaché en E. el faut trouver aux lignes E D. D B. la troiſieme proportionelle D F. de la quelle DO. faiſant les ⅔, je dis, que O. eſt le centre de vibration de cette ſphere ainſi ſuſpendue, c'eſt à dire, que ſes vibrations ſeront iſochrones à un pendule ſimple, dont le plomb eſt conſideré comme ſans grandeur, de la longueur de E o. Tellement que pour la meaſure univerſelle il ſuffit, devoir quelque ſphere ſuſpendue, qui faſſe des vibrations d'une ſeconde ou demi-ſeconde, les plus peſantes & grandes eſtants les meilleures, à cauſe de la reſiſtance de l'air. Je trouve cette longueur E O fort exactement de 9½ pouces de Rhynlande, lorſque les vibrations ſont de demi-ſecondes.

THIS account was lately under the conſideration of the Society; and, when it was ſpoken of at their meeting, order was given, that it ſhould be punctually regiſtered at the ſame time, when it was firſt mentioned, to the end, that Mr. *Huygens* might have his due, and that his inventions be recorded for his honour to poſterity, as well as the inventions of the Engliſh virtuoſi. This juſtice and generoſity of our Society is exceedingly commendable, and doth rejoice me, as often as I think of it, chiefly upon this account, that I thence perſuade myſelf, that all ingenious men will be thereby encouraged to impart their knowledge and diſcoveries, as far as they may, not doubting of the obſervance of the old law, of *ſuum cuique tribuere*. I am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London, Dec. 10, 1664.

SIR,

I WAS lately deſired by my lord *Brounker* to acquaint you, beſides his humble ſervice, with your being elected into the company for the royal mines, and into that of battery, who will therefore be very glad, as well as *Greſham* college, to ſee you here with the ſooneſt. I found by my lord *Brounker*, that he would have been better pleaſed with your thoughts concerning his notes upon the real phænomena, than with your thanks. I told his lordſhip, when I perceived this (though it was only by way of gueſs) that I ſuppoſed, he would have your opinion upon the whole matter from your own mouth, at your return hither, which I hoped would be within a few days. At our laſt meeting (of which I could give you an account no ſooner, than to day, by reaſon of many impediments, taking me off till now) we were entertained partly by ſeveral experiments of refraction, made with vitriol, ſaltpetre, alum, whereof the two former ſuffered a little more, and the laſt, a great deal leſs refraction, than common water; partly, by trials made with pendulums, according to Mr. *Zulichem*'s rule, formerly ſent you, for an univerſal meaſure; which will require more experiments; partly, with the reading of a pretty long dedication, made by Mr. *Joſeph Glanville* to the Royal Society, and prefixed to his book (which was at the ſame time preſented them by lord *Brereton*) intitled, *Scepſis Scientifica*, or, *Confeſt Ignorance the way to Science*. In which dedication the author expreſſeth a very great reſpect to the ſaid body and their deſign; which I was very glad, and ſo were others, to find to be ſo well underſtood, at laſt, by ſome, though, I fear, the great expectation, he raiſeth of their enterpriſe, may be of more prejudice, than advantage to them, if they be not competently endowed with a revenue, to carry on their undertakings.

dertakings. Theſe particulars, thronging in, one upon another, and conſuming all our time, left me none, at that aſſembly, to acquaint the company neither with your conſiderable anatomical obſervation, nor with Mr. *Auſtin*'s propoſals, both which I am perſuaded they will be very well pleaſed with, and the latter, I think, you will not judge amiſs to have it repreſented, and recommended to them, to conſider of the carrying of it on; which I intend, God permitting, to do at our next meeting.

MR. *Henſhaw* (which in my former I intended to have given you notice of, but forgot it) brought lately in an account, concerning the nature of frogs ſpawn, from his own obſervation and experiment, which the company was much ſatisfied with: but it being pretty prolix, I ſhall not ſwell a letter with it, but reſerve the communication to your return.

I HAD no news from *France* this week. Our news at home is, that the parliament is exceedingly divided concerning the way of raiſing that ſum of money, they have voted: yeſterday they were mighty warm, and one of their number told me, they would be very hot this day upon that ſubject; and that yeſterday the manner of raiſing it by way of ſhip-money was ſo much urged, that the court party carried it that way, by ſome, though but few votes; the country gentlemen proteſting (ſome of them) that they dare not return into their country, if it be impoſed after that rate; and one of theſe affirming to me, that he had ſaid it plainly in the houſe, they ſhould take him, his wife and children, and ſend him rather in a ſhip againſt the Dutch, than back into his country, if they would take that courſe. This conteſt and diſagreement will put the Dutch into ſome heart again, eſpecially if it be true, what is now reported, that the king of *France* will, according to the league, aſſiſt them, at leaſt with very conſiderable ſums of money, and with men, if they need them. *Scotland* is mightily averſe from the war, and that upon the account of the deſtruction of all their trade and traffick with the Dutch; they having none, or very little, with *England*.

I HOPE, if I receive the favour of one letter more from you, before your coming home; you will forbid more writing to,

SIR,

your faithful humble ſervant,

H. O.

I RECEIVED the two laſt titles; and have given order for the ſcheme touching the conſervatory of ſnow.

[June 1665.]

SIR,

I ESTEEM it very hard fortune, not to ſee you, before you went out of town: I know not what fatality there was in it, that we could not meet, how much ſoever I endeavoured it. I confeſs, my occaſions of late have very much engaged me to be out of the way, and at the other end of *London*; but yet I did very often enquire in the mornings at my lady *Ranelagh*'s, whether you were in town, but could not hit the time when you were ſo. If I had but been advertiſed any day before, of an hour convenient for you, I would have contrived my affairs ſo, as to have waited on you. I ſhould have expreſſed my thanks for the favour of your communications concerning the comet, and the receipt againſt the ſickneſs (which I beſeech you to accept of herewith) and enquired, what quantity is to be taken of that medicine of *Septalius*, which, I hope, you will pleaſe to ſignify at your firſt conveniency. I did alſo intend to have had ſome diſcourſe with you concerning Mr. *Borreel*, of whom I underſtood, ſome weeks ſince, that he was very ſick, and not likely to recover. I can only ſay this of him at the preſent, that I wrote to *Amſterdam*, and entreated him to conſign his writings, that concern the proof of the truth of Chriſtian religion, to ſuch hands, that we might have a copy thereof at leaſt: whereupon I had this anſwer, that he had taken care for that particular, and that you and I ſhould have a copy thereof, if care were taken, and the expences borne to tranſcribe it. To which I returned, that I was perſuaded you would accept of that condition; nor do I believe now, that you will give me authority to revoke what I have ſaid.

THE firſt ſheet of the Latin, concerning the diſcourſes of thermometers, is printed off; which I alſo propoſed to have ſhewed you; and if I could have ſeen you, I would have adviſed with you, what preambles to make to thoſe two other pieces, concerning Antiperiſtaſis, and the Examen of Mr. *Hobbs*; for, ſince they are to be ſeparated, in the Latin, from the main body of the hiſtory of Cold, the advertiſements prefixed to them, ſeem to me to require ſome alteration; which, I believe, you will, upon looking upon them agree with me in; and, having done ſo, I promiſe to myſelf your care of letting me know your mind about it.

I THINK, the Society will adjourn on Wedneſday next, when I ſhall, if God permit, acquaint you with their letter, and what was annexed to it. They did order me, the other day, to enquire of you, whether that colt, whereof you gave them the monſtrous head, had no other monſtroſity in any other part of its body; ſome of the company being apt to believe, that, if it had not, it might very well be, that it had received a forcible kick on the tender head, whereby the eyes were diſlodged, and forced into one place. I pray, Sir, reſolve this queſtion, if you had the particulars of this colt's whole conſtitution? I hope you will give me leave to inſert it into my next tranſactions as alſo the contents of your letter concerning *Ruta capraria*; and I do entreat your favour and liberality,

of imparting now and then ſomething, that may enrich theſe papers, and aſſiſt me in continuing them, notwithſtanding the diſcouragement of this ſickly ſeaſon.

My laſt news from *Paris* was this. Monſieur *Hevelius a envoyé à monſieur Colbert*, (from whom he hath a penſion) *ce qu'il a obſervé de la comete. Mrs. Auzout & Petit ent trouvé eſtrange, qu'il l'a faite paſſer, par où'elle n'a point eſté, & que de plus il ne l'ait point obſervé au mois de Mars, mais ſeulement on Fevrier, quoy qu'on l'ait veue ce mois là par tout ailleurs.*

On a fait ſaigner un homme chez monſieur Bourdelot, à qui on a trouvè du lait dans la venie au lieu du ſang (I beſeech you, Sir, tell me, whether you have met with the like obſervation.) *Un chirurgion ayant arraché une corne, qui eſtoit venue à la teſte d'une femme, elle en eſt devenue folle.* (And this ſtory is not ordinary.) *Je donnay à un gentilhomme Anglois* (ſo my friend goes on) *le livre de monſieur Petit ſur la comete, où il y a des choſes curieuſes, on inprimera le* Redi delle Vipere *icy à Paris: quand il ſera fait, je vous l'envoyeray.*

Je vous avouë (ſo he paſſes to politicals) *que ſi nos veux eſtoient exaucez, les Anglois ſeroient bien battùs. Quoy qu'il ſoit arrivé, on eſt icy aſſuré, que le combat aura eſté funeſte & ſanglant. Si vous vous joignez à l'Eſpagne, voſtre guerre ne finira pas ſi toſt, & on vous pourra un jour donner de l'exercice.*

SINCE I wrote this, I ſaw a letter of Mr. *Hugenius* to Sir *R. Moray*, wherein he alſo ſeems to be diſſatisfied with monſieur *Hevelius*'s obſervations of the firſt comet. I will give you his own words. *Monſieur Hevelius m'a fait dire, qu'il a fait imprimer un traité du comete premier de 60 fueilles in fol. J'en ay vû quelques unes des figures, qui me ſemblent aſſez eſtranges: car, 1. Il depeint la teſte du comete, comme s'il l'avoit vuë fort grande & avec de certaines taches dedans, ce qui ne m'a aucunement paru* (Mr. *Hook* affirms, to have ſeen ſuch ſpots too) *mais avec mes meilleures lunettes elle m'a tous jours ſemblé tres petite comme les eſtoiles fixes, excepté la chevelure & à Rome on l'a obſervée de meſme. 2. Pour ce qui eſt du cours du comete, il en fait une ligne continuë, qui retourne en elle meſme; d'où je prevoy quelque bigarre hypotheſe; parce qu'il marque cette ligne courbe dans le ciel meſme à travers des ſignes, dont il a donné une figure: mais il faut attendre ſon explication.* I am,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, July 4, 1665.

SIR,

I MUST haſten to return you my humble thanks for that communication of your's, concerning the *Ruta capraria*, as alſo for what you intend to impart about milky blood; to the mention of the latter of which you do annex a parentheſis, which ſeems to imply your removal from *Oxford*; which, if ſo, I hope, it is not for any infection, that may have attacked that place, as it hath begun to do many others. The Almighty be entreated to chaſtiſe us in mercy, and diſpoſe our hearts not to abuſe his mercy. To my exceeding grief, our noble preſident's neighbourhood, but two houſes diſtant from his lordſhip's, is infected alſo: I know not, whether this dreadful neighbour will occaſion him to alter his thoughts for a removal. It is a great mercy, that *Southwark* and *Rotherhith*, where ſeamen are ſo numerous, and other people, that relate to, and work in the navy, remain ſo free yet of the contagion, that there are not above two houſes ſhut up in thoſe quarters. If it ſhould come into this row, where I am, I think I ſhould then change my thoughts, and retire into the country, if I could find a ſojourning corner. In the mean time, I am not a little perplexed, concerning the books and papers belonging to the Society, that are all in my cuſtody. All I can think of to do in this caſe, is, to make a liſt of them all, and to put them up by themſelves in a box, and ſeal them together with a ſuperſcription; that ſo, in caſe the Lord ſhould viſit me, as ſoon as I find myſelf not well, it may be ready to be immediately ſent away, out of mine, to a ſound houſe, *& ſic deinceps*. But theſe are but ſad ſtories, which I therefore leave, to come to let you know, that monſieur *Thevenot* hath ſent you the ſecond tome of his curious voyages in folio, fairly bound, wherein are contained, as far as my curſory peruſal could inform me, ſeveral things not unpleaſing, and inſtructive, both for navigation, policy, and natural philoſophy, though moſt of it be but traduction. I intend, God willing, to ſend it to morrow by the coach or carrier for *Oxford*. There came along with it two diſputations, anti-Carteſian ones, held at *Paris*, by the Jeſuits, in their college of *Clermont*; in the one whereof they endeavour in general to make him and his philoſophy ridiculous and abſurd, urging him with ſuch conſectaries, following from his doctrine, as theſe:

1. *Datur infinita multitudo, major infinities aliâ multitudine infinita.* 2. *In rebus materialibus, non tantum poſſibile eſt infinitum actu, ſed etiam neceſſarium.* 3. *Sunt plures in hoc mundo ſoles, quàm aut arenæ aut piſces* (well put together!) *in oceano.* 4. *Pars non eſt minor toto.* 5. *Nulla eſt hujus univerſi particula, quæ mutare locum poſſit.* 6. *Tam eſt immobilis navis, quæ Rhodani curſum ſequitur, quàm rupes in terra.* 7. *Si partes hujus, quem ſpiramus, aeris quieſcerent, eſſent illæ quovis metallo duriores.* 8. *Non magis propriè dicitur Deus creaſſe cœlum & terram, quàm ſitas in ea domos & urbes.* 9. *Nihil addere Deus huic univerſo poteſt aut detrahere, ne muſcam quidem aut atomum.* 10. *Quò leviora ſunt corpora, eò citius aguntur deorſum.* 11. *Plus eſt in aëre ſubtiliſſimo, ſi bene figitur, quàm in auro, ponderis.* 12. *Fieri naturaliter poteſt, ut homo reipſa mortuus perinde currat & comedat, ac ſi mortuus non eſſet.* 13. *Maximum eſt, ne brevi ſol totus obtenebreſcat, periculum.* 14. *Fatigari magis*

magis unuſquiſque debet ab aëre ſibi incumbente, quàm fatigetur ab onere graviſſimo bajulus. 15. *Horologium tam ægrotare poteſt ac interire, quàm equus.* 16. *Fieri vacuum divinâ virtute non poteſt, quia non poteſt ab humana mente concipi.* 17. *Nec ferrum à magnete trahitur, nec magnes à ferro.* 18. *Poteſt ex quolibet fieri quodlibet citra miraculum.* 19. *Idem ſidus ſine ulla ſui mutatione nunc fieri cometa poteſt, nunc planeta.* 20. *Nolim eſt id, de quo dubitatur à multis, quàm id, de quo nemo dubitat.*

THESE are ſome of the many, that are charged upon that ingenious philoſopher. And, to bring the charge home enough, he ſums up all in this theſis: *Ne plura dicam, neceſſe eſt, ut & mathematicæ, & philoſophiæ & theologiæ diſpliceat hypotheſis Carteſiana. Philoſophiæ, cujus omnia principia notioneſque multis abhinc ſeculis communi conſenſione receptas, evertit. Mathematicæ, quam ad res naturales, quæ ſunt alterius generis, explicandas, non ſine magna perturbatione ordinis traducit. Theologiæ, quatenus ex hac hypotheſi videtur eſſe conſequens,* 1. *Nimium aliquanto tribui corpuſculis fortuitò concurrentibus; quod favet Atheis.* 2. *Nihil eſſe neceſſarium, ſubſtantialem in homine formam admittere; quod impiis & diſciplinæ ſolutioris amantibus favet.* 3. *Nullam fieri in euchariſtia converſionem panis & vini in ipſum Chriſti corpus ac ſanguinem, nec aſſignari, quid in illa converſione deſtruatur, poſſe; quod favet hæreticis.* Who would not, for the moſt of theſe reaſons, be the more enamoured with the *Carteſian* principles?

The other diſputation is entitled, *De duplici cometa, vero & ficto, poſitiones mathematicæ:* wherein that particular opinion of *Des Cartes*, concerning comets is diſputed againſt, and that hypotheſis, which compounds comets out of a congreſs of many ſtars, contended for; which latter, it ſeems, hath been expunged at *Paris*, by a Carteſian, who, together with his maſter, muſt therefore ſmart for ſuch an attempt.

I AM promiſed other, and, I hope, better things, than theſe, from *Paris*, which ſhall be at your ſervice, if God permit.

DR. *Beale* (who received authority for that title, together with that of royal chaplain, from the king, when he was laſt in *London*) ſent me a letter this week, wherein he preſents his very humble ſervice to you, deſiring me withal, to acquaint you with this following ſecret, *viz.* that he was told, by ſeveral perſons, above ordinary ſagacity, that *Kuffler*'s fireworks were in our naval fight; and that a perſon of honour told him, that he ſaw my lord *Brounker* attending, and directing his majeſty, at a view of ſome ſuch execution, by way of diſcharging a ſtrange wildfire out of a gun; which he gueſſed to have ſome affinity with the other. He adds, that he ſhould ſuggeſt a ſecurity, that *Kuffler* (a Dutchman) be not retained againſt us.

I BELIEVE this to be a great miſtake and miſinformation; and I think, that both theſe things, mentioned by our friend, amount to one, and that very differing from *Kuffler*'s invention.

DR. *Beale*, in the ſame letter, tells me of a large diamond, as big as his hand-wriſt, ſent by a chemiſt to a lady, who ſhewed it to him very lately; which ſtone, he ſaith, the chemiſt made out of a black flint, commending it as very clear, and fair as any cryſtal, and fit for pendants, if not too hard for common workmen.

HE adds, that ſpirit of wine is by heat conſumed in one of his ſealed thermometers; and infers from thence, that though air be there commonly impriſoned, yet ſomething of weight and bulk does by heat get out: he will have even ethereal ſteams to have their weight alſo, otherwiſe we ſhould not retain them amongſt us, to fill up expanſions of air, or for our vital food. He had not, it ſeems, ſcales good enough to prove, that ſcaled thermometers loſe weight by inſolation, but by the manifeſt waſte of the liquor he gueſſed it.

OUR ſociety did actually declare a diſcontinuance of their meetings, on Wedneſday laſt; at which time thay had the company of monſieur *de Lionne*'s ſon, and of the agent of the French merchants, monſieur *Damas*, who were alſo both, upon their deſire, admitted as fellows of the Society, after they had been ſpectators of ſome of thoſe experiments, that were formerly made for the making out of that hypotheſis, concerning the air's being a diſſolvent to combuſtible bodies.

AFTER ſome lettice or other ſeeds of haſty growth had been ſown in earth, and left expoſed to the open air, and at the ſame time, ſome of them put in an exhauſted receiver, the former was ſprung up, two or three inches high, in a week; but the latter did not appear at all: whereupon air being admitted and continued to the latter, it did, within another week, ſhoot up as high as the other.

OUR news is, that a part of our fleet is returned to ſea under prince *Rupert*, the duke being at laſt prevailed with, to ſtay at home; and that we cured, the other day, two Dutchmen of their infidelity, concerning the life of the duke and the prince, by their own eyes, and by kiſſing both their hands. By Mr. *Dury*'s letter out of *Helvetia*, I find, that the fame is ſpread in remoter parts, that our fleet hath been worſted. The king hath further knighted *Tiddiman*, *Jordans*, and *Cuttings*. *Reynolds*, that was in *Guinea*, is at laſt come home by the *Barbadoes*, whence he hath conveyed into our ports eighteen or twenty ſugar-ſhips, and brought in his own veſſel, for ſome comfort of the Guinea company, ſome 20000 *l.* in gold, as Mr. *Slingſby* told me.

THE king's expected to morrow at St. *James*'s, to ſit there in council. The court is not like to ſtay long at *Hampton*, the contagion being in that town alſo; but to remove to *Saliſbury*, and thence to *Oxford*, in Auguſt, to meet the parliament there, if that place remain uninfected.

I DO not incloſe here my fifth tranſactions, for fear of ſwelling the letter to above their worth; yet there are ſome particulars in it, communicated by Sir *R. Moray*, about the working of * * * and mines without air-

ſhafts; and a way of breaking eaſily and ſpeedily the hardeſt rocks; which I think may be very uſeful. I hope my next will receive ſomething again out of your ſtore, which ſhall be acknowledged by,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

London, Aug. 10, 1665.

SIR,

THE Italian gentleman, now at *Oxford*, whom you hint to me in the favour of your laſt, I am, I think, not unknown to. I gueſs, it is ſignior *Ubaldini*, a nobleman of *Tuſcany*, a late proteſtant proſelyte, of good natural and acquired parts, as far as I have been able to diſcern, by the ſmall acquaintance I had with him, when he was at *London*. He is indeed, as you ſay, very likely to give a good account of the Roman affairs, if his charge have not cut off that entercourſe, whereby he might be enabled to do ſo; the conſiderableſt tranſactions there, being fallen out, I think, ſince he left that country. The laſt Pariſian letters relate this of it: *Nous ſommes tousjours mal avec le pape. On combat ſon infallibilité* (this will pleaſe Mr. *White*, as much as any proteſtant) *autant bien & avec autant de vigueur qu'il eſt poſſible. Le parliament & la Sorbonne dans cette rencontre agiſſent de concert, & font leur devoir. Je vous diray ce que produira leur union. On inprimera un traitté de monſieur Talon* (the French king's ſollicitor general) *ſur ce ſujet, que je vous envoyeray, quand je pourray.*

Je ne trouve perſonne (ſo he goes on upon another occaſion) *qui aille en Angleterre, & je ne ſcay, comment vous envoyer ce que je vous ay promis. Monſieur Petit m'a demandé, ſi je ne pourrois pas vous faire tenir ſon livre de la comete, mais je luy ay dit, que je ne ſcevois perſonne, qui paſſaſt la mer. De luy, & meſſieurs Auzout, Martel, Thevenot, & de tous ceux, qui ont l'honneur de vous conoitre* (thus he compliments) *j'ay ordre de vous exhorter à ſortir de Londres, le danger eſtant par trop grand. Une perſonne de &c. ne doit pas hazardée & exposée à un peril ſi grand. Vous y ſongerez, & vous conſervez pour vous & pour vos amis.*

THIS kindneſs, expreſſed in the laſt period, did ſomewhat ſurpriſe me, not thinking, the French had been guilty of that quality in ſo high a degree. I am likewiſe much obliged to you, Sir, for your favour of intereſting yourſelf, as you were pleaſed to ſhew it in your laſt, in my health; which I ſhall endeavour, if the Lord ſhall think good to continue it, to employ with as much zeal for your ſervice, as for myſelf.

BUT, to return to the matters of that French letter; it gives me the following extract of a burning-glaſs, made, it ſeems, at *Lyons*, which I entreat, Sir, you would pleaſe to compare with your own, that I have heard you commend, if I remember well, for burning pieces of ſilver; and having compared this deſcription with the beſt effects of your's, to acquaint me with the difference, and in particular with thoſe, that concern the dimenſions. If I find, that the glaſſes, we have of this kind in *England*, do not yet approach in goodneſs to that here deſcribed, I may, I think, in my next Tranſactions inſert it, if God give me life; and if you find it ſo too, I ſhall do well, I think, not to anticipate the printing thereof, by other multiplied communications. It is verbatim, as follows.

Lugduni, Julii 18, 1665.

De efficacia ſpeculi dom. Vilette, vera omnia perſcripſerat D. P. Bertet. Vidimus effectum repetitis vicibus, mane, meridie, à meridie: ſemper efficaciſſimè urit, & fundit, & liquat objecta quævis, pauciſſimis certè exceptis. Nobis præſentibus eliquavit argentum (une piece de 15 *ſols) cuprum (un liard) orichalcum, fruſta lebetis ferrei fuſi, minuta fruſta chalybis, capita minora clarorum ferreorum; nam ferrum à fabris cuſum aliàs non, aut ægrè, liquat: ſed calcinat vitrum, ſaxa ædificiorum (quæ in vitrum, fundendo, redegit, ſicut & oſſa animalium) etiam vitrum ab utraque parte politum eliquavit, quia pori ejus ſtrictiores, quàm ut radios à ſpeculo reflexos ſimul exciperent: candelam accendit promptiſſimè, baculos craſſos ligneos momento inflammat jucundo ſpectaculo. Radius ſpeculi eſt pedum* 4, *& pollicum* 8; *focus, pedum* 2, *&* 4. *pollicum; diameter circumferentiæ, pedum* 2, *pollicum* 6. *& linearum circiter* 2; *ſpeculum etiam à parte convexa politum cernitur; ſed rectius ab ea politura abſtinuiſſet artifex ob foramina quædam & hiatus, exteriorem faciem nonnihil deformantes, quanquam & hoc nihil detrahat perfectioni ſpeculi concavi. Speculum ipſum jam eſt cum ſuo pedamento abſolutum: æſtimatur* 150. *aureis Ludoviciis.*

SIR, I rejoice very much, to underſtand, that you have two ſuch excellent ſubjects ready again for the preſs; and I hope, that this extraordinary calamitous ſeaſon will not prove a real diſcouragement for the future. I aſſure you, I have done my part, both as to the tranſlation of the thermometrical piece, and to the preſſing of Mr. *Crook* to have it diſpatched. But the interrupting of the correſpondence with *Holland*, on one ſide, and this ſad viſitation, on the other, hath diſappointed all, for the preſent. I have begun to tranſlate the body itſelf of *The Hiſtory of Cold*; and what you ſhall think good to commit hereafter, when it can be done with more ſafety than now, to my hands, concerning the hydroſtaticks, and the forms, either for the printing, or tranſlating, or both, I ſhall, God willing, ſtudy to ſerve you in, with the beſt of my power.

I HAVE now put all my little affairs and my papers in order, ſevering what belongs to the Royal Society, to yourſelf, and to Mr. *Dury*'s child and eſtate, *&c.* from mine own, and intending, if the hand of the Almighty

ſhould viſit me, with others, at the very beginning of my indiſpoſition, to have thoſe books and papers (and particularly your's, and my tranſlations concerning you) conveighed to a healthy place, and ſo to recommend them there, that, in caſe of the like accident to them, they would take the like care for theſe things.

I AM very well pleaſed with the obſervation about the wood's being petrified in ſandy earth; and I humbly thank you for the communication thereof. I doubt not, but you will get a full proof concerning the matter of fact, and then give me leave to inſert it in my tranſactions, if I live to print any more. I wonder, whether thoſe experiments, you mention to have made with the poiſon drawn from tobacco, agree with thoſe, that were made at *Greſham*, and by Mr. *Daniel Coxe*.

I SEE I have no more paper left, than is neceſſary for folding up this letter: wherefore it is time to ſay, what I am really,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London, Aug. 24, 1665.

SIR,

AFTER ſuch long letters of mine, lately thronging in upon you, I thought it but fit to give you a little reſpite, and to promiſe you ſhorter ones hereafter. I cannot but return you my humble thanks for imparting to me ſomewhat of your philoſophical employments where you are. I am very glad to underſtand, ſome others of our Greſhamiſts are active alſo, and like to give us a good account of their ſpent time, at our meeting again, which I beſeech God to haſten, if it be his will. I ſhould be very glad, to hear your thoughts, concerning the Gas ſulphureum, I mentioned formerly to you; as alſo a further information of the dimenſions of your own burning-glaſs, if you have taken it out. Dr. *Wren* is well received at *Paris*, and conducted to ſome of their meetings; and made acquainted with meſſieurs *Auzout*, *Petit*, and *Thevenot*. My correſpondent tells me this: *Je l'ay mené chez monſieur Bourdelot, où ce jour là on dit quantité de belles choſes. Il approuva fort ce qu'on y dit, mais il ſouhaitoit, qu'on fit des experiences.* (This is like a member of the Royal Society.) *Le medecin de la reyne de Pologne y explique la nature d'une maladie, nommée plica, à laquelle les Polonois & les Coſaques ſeuls ſont ſujets. On y parla d'un ſourd & muet, qui danſe en cadence, & des pluſieurs autres choſes, qui luy plûrent aſſez. Nous l'avons auſſi mené chez le grand architecte le chevalier Bernini. Il a vû le buſte, qu'il fait du roy en marbre, & le deſſein, qu'il a fait du Louvre, dont il vous entrétiendra. Je luy ay fait voir ce matin la machine le monſieur Paſcal, avec laquelle on peut faire toutes ſortes de regles d'arithmetique.*

I FIND, by the ſame letter, that the king of *France* hath now openly declared for *Holland*, and withal made monſieur *de la Fueillade* general of the French forces to be ſent againſt *Munſter*; which doubtleſs will embroil all *Germany* afreſh: yet the ſaid biſhop is like to go on in his deſign, which is double, to attack the Dutch upon his own account, and, if he proſper there, to ſend his army to reinforce *Flanders* againſt the French.

THE two fleets are like to engage again very ſhortly. We were conſiderably foiled at *Bergen*, yet not without a great loſs to the Dutch, having, as we ſay, ſunk three of their ſhips, and deſtroyed above one thouſand men.

OUR own eight Eaſt-India ſhips, valued two hundred thouſand pounds ſterling, and our Eaſtland fleet, to the number of twenty, laden with ſubſtantial naval commodities, are all ſafe in our harbours. All were comfortable enough, if the Almighty were pleaſed to remove or mitigate this ſore calamity, that lies upon us. Yet I cannot but obſerve, becauſe very obvious, that not many houſes of perſons, that have healthy conſtitutions, and have not vitiated them by intemperance or otherwiſe, and do enjoy a comfortable ſubſiſtence (all theſe being taken together) are infected. But yet I think this very far from a demonſtration againſt the plague. Signior *Borrhi*, which I wonder at, remembers him to me, in a letter, written by a friend, and offers me (very kindly) his antidote for the plague, if I will aſſign a perſon, to whom he ſhall give it. I could eaſily find a perſon, if I could but find a way to have it ſent over. However the kindneſs and favour is the ſame, and I have let him know ſo much, by a few lines, I have inſerted for him in the anſwer to my friend. The ſame *Borrhi* had received news from *Vienna*, importing, that now the Chriſtians need not fear the Turks any more, there being work enough cut out for them at *Meccha*. And it ſeems, that that news is continued ſtill by letters to *Amſterdam*, the Jews of *Paleſtina* referring ſtill to their former letters, and alledging, that all their ſynagogues under the Turk, fearing a maſſacre, by reaſon of this matter, have ſtrictly forbidden the publiſhing of it, as yet. But my faith grows fainter and fainter, in this matter, finding, the news is not confirmed with that vigour, it began with. I remain,

SIR,

your faithful humble ſervant,

H. O.

London, Aug. 29, 1665.

SIR,

I MAKE the more haſte of acknowledging the favour of your laſt, becauſe I found myſelf urged by my thoughts, with ſpeed to offer ſome of my conſiderations upon the contents of a letter from Dr. *Beale*,

which I received yeſterday, almoſt at the ſame time with your's. If he be not miſinformed by one of his majeſty's chaplains, who now waits at *Saliſbury*, and laſt week gave him a viſit, you, Sir, are nominated provoſt of *Eton*; which, if ſo, our ſaid friend hopes, and ſo do I, you will not refuſe it, conſidering, that that place hath many opportunities of influence on the univerſities, and is able to oblige many: which ſtrengthens our hope, that you will accept of it, eſpecially ſince it is, as I underſtand, no burthen, and much accommodation; it being alſo but half a day's journey from thence to *London*, and not much more to *Oxford*. All God's bleſſings be upon you, and his power determine your deliberations for the beſt to yourſelf, and his honour. If you ſhould be ſo directed, as to embrace it, and there ſhould occur any laborious diſpatches, that might be devolved upon others; I know thoſe, that honour and love you, would be ready to eaſe you; and, among them, none more ready to do you ſervice than myſelf, as far as I am capable. I humbly thank you for your opinion of the Helmontian Gas, which is no ſmall encouragement to me to continue the uſe of it, as it is prepared by *D. Poleman*. I hope, that you will alſo oblige me, with communicating to me the dimenſions and effects of your burning glaſſes; the meltings of caſt iron, glaſs, and ſtone, in that of *Lyons*, look like impoſſibilities, ſo that I ſhall endeavour to get the thing well atteſted, before it be publiſhed in print. I heard as yet nothing of a new comet, ſeen by any in this town; only Dr. *Beale* intimated, a fortnight ſince, in general, that they talked afreſh of prodigies in the air, and ſome of another comet; but nothing in particular then, nor ſince. I ſhould be glad to underſtand, at what hour, and in what quarter of the heavens, it was ſeen by thoſe of your acquaintance in *Eſſex*. There were ſome of our Greſhamiſts, that thought one or the other of the two former comets might be ſeen again, after ſome time; whence it is a queſtion, whether this, that is pretended to be lately ſeen, be a new one, or one of the former, grown viſible again.

I CONCEIVE, it would be obliging to the publick, to print that catalogue, you mention, of the anti-peſtilential medicines: and, I think, it would be moſt conveniently done at *Oxford*, our ſtationers and printers having, for the moſt part, taken the country, as well as others.

I ACKNOWLEDGE, that that jealouſy, about the firſt authors of experiments, which you ſpeak of, is not groundleſs; and therefore offer myſelf, to regiſter all thoſe, you, or any perſon, ſhall pleaſe to communicate, as new, with that fidelity, which both the honour of my relation to the Royal Society (which is highly concerned in ſuch experiments) and my own inclinations, do ſtrongly oblige me to.

FROM ſea we hear of no late action; our fleet being yet at *Solebay*, repairing the damage received at *Bergen*, and by ſtorm. From *Paris*, I had this, by the yeſterday's poſt: *La public a bien de l'obligation à monſieur Boyle de travailler ſi genereuſement & ſi ſçavamment, comme il fait: il faut avouer, que l'Angleterre à grand nombre de gens ſçavans & de curieux, & en plus grand nombre, que le reſte de l'Europe: tout ce qui vient d'eux, eſt ſolide & particulier; le monde ayant eſté aſſez long temps amuſé des notions generales. Voſtre cour* (ſo he paſſes on) *a refuſé les propoſitions, que la roy luy a fait faire d'un accommodement; ce qui l'oblige à executer le traité fait avec meſſieurs les Eſtats. De plus, on ſcait ce que le Roy d'Angleterre fait avec l'Eſpagne: peut eſtre, qu' avec le temps il n'y trouvera pas ſon compte. L'eveſque de Munſter continue ſes levées, mais on croit; & il y a bièn de l'apparence, qu'elles ſe font en faveur de la maiſon d'Auſtreche. On a bièn des reſſources icy, le roy ayant de l'argent & des hommes, & quand il ſera joint aux Hollandois, il aura des vaiſſeaux, & vous incommodera peut eſtre autant, que vous le pourriez faire, quoy que les Anglois nous mepriſent, & croyent, qu'on ne peut pas leur reſiſter. Quand ils auront le ciel & la terre pour ennemis, il changeront de language, & ſeront, peut eſtre, eſtonnez, non obſtant leur fierté.*

La mort du duc de Mantouë eſt certaine. Monſieur l'Abbè de Beaufort eſt à la Baſtille, pour les affaires d'Angleterre. La reyne mere ſe porte mieux. Le roy a eſté ſeigné au pied, à cauſe de quelque petite indiſpoſition. Depuis un jour ou deux on eſpere beaucoup de la ſante de la reyne mere: mais avec tout cela ceux, qui conoiſſent ſon mal, ne croyent pas, qu'elle en puiſſe rechaper, la maſſe du ſang eſtant corrompue. Cependant un medecin de Bar, nommé Alliot, reuſſit aſſez bien, & fait tout ce qui ſe peut pour conſerver la reyne. Monſieur Colbert a en le cordon bleu par la mort de monſieur de Nouveau, qui eſtoit treſorier de l'ordre. Quoy qu'on face à Rome, il faudra, que le pape ſouffre, qu'on condamne icy ſon infallibilité, qui eſt contre la raiſon, & contre les loix de l'eſtat. Le roy d'Eſpagne diminue tous les jours: neantmoins ſa flotte d'argent eſt arrivée à Cadix, d'où on eſcrit, qu'il y a un galion de perdu, que les Corſaires ont pris. De peur, que les Anglois ne reviennent à Berguen, les matelots Hollandois ont fait des batteries au pied des chaſteaux pour pouvoir tirer à fleur d'eau: & l'on y a tendu une groſſe chaiſne, & mis des maſts liez enſemble à l'entree du port, en attendant qu'on les vienne tirer de là. En cas qu'ils ne puiſſent pas ſe deffendre, ils mettront le feu aux merchandiſes, pluſtoſt que de laiſſer entre les mains des Anglois un butin auſſi riche, qu'eſt celuy là.

BUT for fear of committing again, what I condemned in my laſt, I ſhall end with repeating the aſſurance of my being,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London, Sept. 18, 1665.

SIR,

SEEING you give me no authority to endeavour to deter the Dutchmen from printing

printing their book of Colours, I think, I ought not to appear in that buſineſs: monſieur *Herringman* may thank himſelf, and impute the loſs, it may cauſe to him, to his own delays. If the importunity of company do drive you away from *Oxford*, I hope, we ſhall hear betimes of the place you intend to remove to, where you are not like to be free from the perſecutions of my letters, if the Lord ſpare me farther, as he hath been pleaſed to do hitherto. Though we had ſome abatement in our laſt week's bill, yet we are much afraid, it will run as high this week as ever. M. *Graunt*, in his Appendix to his Obſervations upon thoſe bills, (now reprinted) takes notice, that foraſmuch as the people of *London* have, from *anno* 1625, to this time, encreaſed from eight to thirteen; ſo the mortality will not exceed that of 1625, except the burials ſhould exceed 8400 per week, which number we have been pretty near to. Signior *Borrhi* hath expreſſed a real favour and kindneſs to me, which, when he firſt mentioned it, I lookt upon as a mere compliment: for he hath ſent me his own Antiloimoides, ſo conveniently prepared, that he encloſed it (the medicine itſelf) in a fine bladder, which he ſo ſquared, that it was handſomly put up in a letter, and ſo came ſafely to my hands; but had that ſtrength of ſcent, that the man, who brought the letter, ſaid, it muſt be ſome rare medicine, come from beyond ſea, againſt the plague. It is made up in the conſiſtency of mithridate or treacle, and hath a very comfortable ſmell; yet I have not hitherto made uſe of it, but only taſted as much of it, as the bigneſs of a pin's head, but know not what to make of it. Methinks, I find, myrrh, and aloe, and mithridate or treacle in it; and I had ſent you a pattern of it, in this very letter, but that I thought you might be too much ſurpriſed by the ſcent thereof. Wherefore I conceived I did beſt to make this a forerunner, and, if you forbid me not, to let the thing itſelf follow by the next, God permitting; which I am the more deſirous to do, becauſe I have an opinion, you will be pleaſed with ſeeing and examining that medicine, which comes from ſuch a man, in ſuch a way, for ſuch an end, and with ſuch a character annexed to it by the author, that, if it were for a king, we know not to give any better, both for preventing and expelling the plague.

HAVING now received monſieur *Hevelius*'s preſent, which Dr. *Wallis* hath a ſhare in, I am now enquiring for a convenient and ſafe conveyance to him, which I ſhall have no ſooner found, but I ſhall, God willing, make uſe of it. It is, methinks, very pleaſant to read, and built upon an hypotheſis, which is ingenious, full of ſpeculation, and appearing ſufficient to ſolve all the phænomena of comets. This may *movere ſalivam*.

CALLING the other day at the Biſhop's head in *Paul's Churchyard*, where Mr. *Thompſon* abideth by it, I heard of him, that *Kircher's Mundus Subterraneus* is come over, and that he looks for the delivery within four or five days: I perceive, the price will amount to fifty ſhillings at leaſt, and yet but one volume. I find alſo, by his catalogue, that the ſame *Kircher* has publiſht a *Scrutinium Phyſico-medicum peſtis*, which I never ſaw before. There is alſo come over *Steno de Muſculis & Glandulis*, which I know not whether it hath been ſeen here formerly. I find nothing elſe, worth buying; except it be *Johannis Hooker Dantiſcani* (*Hevelius*'s kinſman) *Motuum Cæleſtium Ephemerides, ab anno* 1666, *ad* 1680; grounded upon the Tychonian obſervations, and Keplerian hypotheſes, and the Rudolphin tables, compoſed *ad Meridianum Uraneburgicum*.

I BELIEVE, our taking of ſome more Dutch ſhips, ſo that there are in all ten men of war, and twenty merchantmen, is come to *Oxford* ere this; as alſo that our fleet is returned to *Solebay*, having been ſomewhat diſperſed by the late high winds; yet, God be praiſed, without conſiderable damage to us. I humbly thank you for the favour you intend me, of ſending Mr. *Auſtin*'s new and reformed edition; and when you can conveniently ſend me your queries for the burning glaſs, they ſhall, I hope, be well recommended, by,

SIR,

your very humble,
and faithful ſervant,
H. OLDENBURG.

P. S. I FIND, Sir, by your ſilence, that you are not ſatisfied with the teſtimonials hitherto given of the Iriſh healer. Dr. *Beale* and Dr. *Sydenham* jump in a full aſſurance of the truth of the thing, and the latter of them ſaith, that for all he brought as much prejudice againſt it, as any man could, yet now he hath no more reaſon to doubt it, than to doubt, whether he is a man, or ſome other animal. He adds, that if I ſhall deſire particular accounts, he will take them for me, but that they are ſo many, that it may as reaſonably be demanded of me, who am at *London*, who in particular have died of the plague, and how they are taken, to the end it may be diſcovered certainly, whether there be ſuch a diſeaſe or no.

London, Sept. 18. 1665.

SIR,

I VENTURE to ſend you here encloſed a ſmall proportion of Signior *Borrhi*'s Antidote, which hitherto I have made no other uſe of, but barely to taſte it, much ſcrupling in this tickliſh time to ſtir the ſtate of my health, eſpecially by the uſe of a medicine I have no elogium of, but that of the author alone. Yet I do very much wiſh, in caſe you taſte it, or otherwiſe examine it, that you would favour me with a free communication of your judgment concerning it, as alſo of your advice about the beneficialneſs

cialneſs or conveniency of uſing it as a preſervative, for which the donor recommends it as much as for an expulſive. And this advice I do now take the greater liberty to entreat of you, ſince I am very credibly informed, that you have indulged to the academicans to degrade yourſelf to be doctor, and therefore am the more confident, you will both as ſuch, and as a noble friend, aſſiſt me with your counſel herein. I return you my humble thanks for communicating to me the ground of your hydroſtatical inſtrument, which I am much pleaſed with. Turning over a part of *Kircher*'s *Mundus Subterraneus* the other day at Mr. *Thompſon*'s (who will certainly keep an exemplar of it for you) I found him treat alſo ſomething of hydroſtaticks, as alſo of metallo-ſtaticks; but in what manner, a bare running over of ſome leaves could not enable me to give you an account of. In the mean while, I do much fear, he gives us rather collections, as his cuſtom is, of what is already extant and known, than any conſiderable new diſcoveries. The titles and heads of chapters are very auguſt: if the matter equal them, I ſhall not repent of what I muſt pay for it. I have already offered Mr. *Thompſon* the value of forty ſhillings in books, I intend to part with (which himſelf muſt acknowledge to be more worth) and yet he demurs to make the exchange, though *Kircher*'s book make but one middle-ſized volume, the cuts of it being alſo not very many, and moſt of them in wood. It is certain, this book takes in all the conſiderable particulars belonging to the world, waters, metals, ſtones, (where he forgets not that of the philoſophers) fires, earths, inſects, underground men and dæmons themſelves, *&c.* but how he acquits himſelf of it, you muſt judge. I have ſent this very day by water to *Oxford*, *Hevelius*'s *Prodromo Cometicus*, deſigned by the author for Dr. *Wallis*, accompanied with another for the biſhop of *Exeter*, and my letters for them both; and I hope, the roll will come ſafe, and the biſhop will meet his preſent, coming to ſit in parliament. When you are ready to ſend your queries about the great French concave, I ſhall be ſo alſo, to recommend them, I hope, to good purpoſe. A late letter from *Paris* to me hath this further, for its commendation. *La miroir de Monſieur Septalius* (which I gave lately a deſcription of to Sir *R. Moray*) *n'eſt pas à comparer à celuy de Lyon, que n'a pas ſon pareil au monde. Monſieur Auzout vous en entretiendra d'avantage au premier jour* (but this entertainment I have not had yet) *et vous en ſera bien d'autres effects, ou au moins plus conſiderables, que ceux, que je vous ay mandé: bien de gens le marchandent; et il y à bien de l'apparence, qu'il ſortira de France, nos François n'eſtans pas aſſez curieux.* I cannot imagine, after what manner the preſervation of bodies uncorrupted for many years, without embalming or other artifice, can be performed, except it be by intenſe natural cold, or by exſiccating ſands. I hope I ſhall have a ſhare in what the traveller, you mention, may impart to you concerning it; and I am very glad to find you remember a ſecond edition of the Uſefulneſs of experimental Philoſophy, which you can hardly think how much it is deſired by all ſorts of men. I have gone a good way in continuing the Latin traduction of it: the like I have done of your experimental Hiſtory of Cold; in regard of which latter it will be, methinks, not only unneceſſary, but alſo prejudicial to the printer of the Latin for Cold, to have the ſame tranſlated into Italian, for this latter would certainly hinder the ſale of the Latin copies in *Italy*, where they love every whit as well to read books in Italian, as the Engliſh do to read them in Engliſh. Wherefore I propoſe only, whether it might not do well, to give ſome indirect hint to that Italian gentleman, that has ſuch an intention, as you ſpeak, that the Latin verſion is like to be finiſhed within a month, or ſo, and that the copies thereof being ſent abroad into all the learned parts of the world, and conſequently into *Italy* too, will preoccupate the ſale of the Italian tranſlation, *&c.* What I mention of finiſhing it within a month or thereabouts, I hope, by the help of God, ſhall be performed.

Now for ſome ſtate news, and I have done. I received lately a letter from *Amſterdam*, which does not only acknowledge their late great loſs, but laments withal, that they ſee, that all the power they can make, and all the policy they can uſe, avails them nothing, divine providences appearing ſo adverſe to them. It ſeems by all the circumſtances of this letter, that they had contrived the greateſt power, and the beſt conduct they are maſters of, to come off well this ſecond time, and to fight their merchantmen home with good ſucceſs; but being extremely defeated in their expectation, the ſobereſt of them fall to conſider, what will be the event of it, eſpecially now the biſhop of *Munſter* is alſo actually upon their ſkirts, and finds as yet no conſiderable reſiſtance. I am perſuaded, that if they would yet come down from their haughtineſs, they would find much generoſity and equity in the Engliſh, of granting them ſuch terms, whereby they might handſomly continue their trade for a comfortable ſupport of their country; and they hardly deſerve more, in my opinion. I am apt to believe, that *France* will prove a broken reed to them; and that at laſt, ſeeing the ſea power of *England*, they will ſtrike in with them for a ſhare in trade; eſpecially now they ſeem to be ſet upon it more than ever, to advance the ſame in their country: for which purpoſe orders are already iſſued, as I find by letters, not only to promote the manufactures of cloth and ſilk, but alſo to ſet up ſeveral others, of which they ſpecify glaſs-making, inſomuch that no Venice-glaſs is any more to be imported into *France*; as alſo lace-making, of which latter commodities none is to be ſold henceforth in that kingdom, but what ſhall be made by their own people, and ſo of other manufactures, that ſo they may keep their monies at home, and make conqueſts with

with it abroad. The French king hath ſent an embaſſador *à la Porte Ottomanne*, which is the ſame, that was lately ſo ill treated there. To conclude; *La Reyne mere ſe porte beaucoup mieux de ſon cancer, le medicin Aliot luy mettant des poudres, qui font ſortir la chair pourrie. Il croit fort de la pouvoir guerir, ce qu'il a deſſein de faire en reduiſant la mammelle à rien par ſes poudres. Le roy ayant reconnu la foibleſſe de la medecine, et l'ignorance de ceux, qui la pratiquent, il les à tourné en ridicule dans une comedie, qu'il à fait jouër à Verſailles en ſa preſence.*

I DOUBT not, but you will rejoice at the decreaſe of the plague, ſo conſiderable this week, that the burials are leſs by 1837, than they were the week before. The Lord give us truly thankful hearts, and be pleaſed to enlarge his mercies more and more, and to ſtop the current of abuſing them. So prays,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

JUST as I was going to ſend away theſe letters, came ſome both of *France* and *Holland* to my hands, which are all conſiderable; but I have not time to add them now: only this I ſhall touch, that the French letters aſſure the death of the king of *Spain*, and the Dutch the Meccha news. M. *Serrarius* tells me, that the tranſcribing of Mr. *Borrel*'s manuſcript goes on apace, and deſires, that ſome money may be aſſigned, at firſt ſome thirty or forty gilders, which is about three pound ſterling: you may ſee his own letter, if you pleaſe.

London, Oct. 5, 1665.

SIR,

CONSIDERING with myſelf yeſternight, what my employment would be this day, I did not think I could poſſibly redeem ſo much time, as to ſcribble a few lines, to perform therein what I promiſed by my laſt. And I had already intimated ſo much to Sir *R. Moray* in a letter, which I wrote for him yeſternight late, after I had taken leave of a pipe of tobacco, ſuppoſing he would be gone from *Oxford* before my next ſhould come there. Yours of Septemb. 30, the ſame date with the laſt of Sir *R. Moray*'s, came not to me till this morning, whereas I received the other on Tueſday; the cauſe of this difference I cannot imagine, and not being at home when it was brought, I could neither enquire into it. I have mentioned ſome more particulars of Sieur *Borrhi*'s medicine in Sir *R. Moray*'s letter, which I know he will ſhew you; wherein you will alſo find, that it works chiefly by ſweat, and at laſt *par ſelle*, which circumſtance will perhaps make you gueſs the better at the chief ingredient thereof.

THE mentioned letter to Sir *Robert* contains all the ſtate news I have received ſince my laſt to you; and I am perſuaded they will not diſpleaſe you. For philoſophical news, I ſhall in thoſe few minutes I have remaining, haſten to give you that account, which I received laſt week from *Paris* concerning the *miroir ardent*, and which I thought I ſhould have been obliged to put off till another week. It came to me in French, in theſe very words: *La figure du miroir eſt ronde, du diametre de 30 pouces et quelque choſe de plus. Il eſt bordé d'un coſte d'un cercle d'acier, à fin qu'il demeure dans ſa juſte meſure. Il eſt aiſé de le remuer, quoy qu'il peſe plus d'un quintal, et l'on le met aiſement en toutes ſortes de ſituations. Le point brulant eſt diſtant du centre du miroir d'environ 3 pieds, le focus eſt large, comme d'un demy Louys d'or. On y peut paſſer la main, pourvû que ce ſoit avec precipitation, car ſi elle y demeure le temps d'une ſeconde, on ſeroit en danger de ſe faire beaucoup de mal. Le bois vert prend feu en un inſtant, comme pluſieurs autres corps. Un petit morceau de fer de marmite s'eſt mis en goute preſt à tomber à terre, en 40 ſecondes. La piece de 15 ſols à eſté percée en 24 ſecond. Le clou de payſan s'eſt mis en goute en 30 ſecond. Un bout de lame d'eſpee d'Olinde s'eſt bruſlé en 43 ſec. un jetton de letton à eſté percé en 43 ſec. un petit morceau de fer bleu à eſté percé en 6 ſec. Un morceau de cuivre rouge s'eſt mis en goute preſt à tomber en 42 ſec. Un morceau de quarreau de chambre s'eſt vitrifié et mis en bouteille en 45 ſec. L'acier, dont les horologers font leur reſſorts, s'eſt trouvé fondu en 9 ſec. La pierre de mine, que l'on met aux arquebuſes à rouët, s'eſt calciné et vitrifié en une minute juſte, et un morceau de mortier s'eſt vitrifié en 52 ſec. Enfin il n'y à point de corps, qui par ce feu lá ne ſe conſomme. Si l'on vouloit faire fondre quelque groſſe quantité de metal, il faudroit beaucoup plus de temps, outre que l'action ne ſe fait que dans la grandeur du focus, de ſorte qu'on n'y expoſe ordinairement, que de petits morceaux. Un, nommé Mr. D'Alibert, l'achepte, et en donne 1500 livres.*

SIR, I preſume this relation will be no diſcouragement to the queries and experiments you have deſigned for this glaſs, which I long to receive, and to ſend to my correſpondent.

I CANNOT now add any more, than to intimate in a word, that the Meccha news grows ſtronger; and to return you my humble thanks for giving me, though abſent, a ſhare in your philoſophical collection, which is ſome ſolace for my unhappineſs of not enjoying more. Methinks you are ſo many fellows of the Society, that you can make more than a quorum, but that you want the preſident. I rejoice to find by yours, that you intend to make ſo good uſe of that opportunity as you did; and I hope, ſince you are ſo many, and ſo conſiderable ones of our body, you will make it a part of your buſineſs, ſo to inſinuate the deſigns of the Royal Society into the Oxonians, that they may reliſh them as much, as moſt of them have been reported to diſguſt them, and give them cauſe to prefer that ſolidity of knowledge, the

ſaid Society aims at, before ſcholaſtical intentions. So ends abruptly,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

I ACKNOWLEDGE myſelf unworthy of the favour expreſſed to me in your collection by thoſe worthy perſons, you were pleaſed to name. I humbly entreat you, to aſſure them of the deep ſenſe I have of it, and of my very humble ſervice, particularly to Sir *William Petty*, Dr. *Wallis*, and Dr. *Coxe*.

I KNOW not, Sir, whether I mentioned to you in my laſt Mr. *Serrarius*'s deſire, about the diſburſing of ſome money for the tranſcribing of Mr. *Borrel*'s papers. I am ſure, I intended it; but often, I think, the concurrence of many particulars makes me forget ſome of them.

London, Oct. 10, 1665.

SIR,

I AM glad, you like the French burning-glaſs, which you will do the more, being aſſured by the letters ſent me, that the performances mentioned are ſo real, that no man there doubts of the truth thereof. Since I ſent you the tranſcript, I have loſt the original, at leaſt I have ſo miſlaid it, that I muſt uſe the freedom of deſiring a copy of what you have.

THE enquiry about ſounds is worthy of philoſophers; and I find, that *Kircher*, even under ground, could not forbear to meddle with it. For, in his *Mundus Subterraneus*, treating of the center of the earth, and of pendulums, he takes occaſion to treat *de chordarum harmonicarum motu*, affirming, that the motion of ſtrings in muſical inſtruments is after the ſame manner, as the motion of pendulums, and deriving thence all muſick. *Cum enim* (ſaith he) *ſonus quilibet componatur ex tot acuminis et gravitatis gradibus, quot diadromorum reflexorum puncta ſunt, quibus toties auris tympanum, dato aliquo tempore, à commoto aëre percutitur; luculenter patet, tam ſonos, quàm conſonantias diſſonantiáſve omnes, nil aliud eſſe, præter varios motuum aëris, ad aures appellentium, numeros, nervorum ſpirituumque acuſticorum ope ad cerebrum delatos.* And a little after, he propoſes this experiment; *tendantur duæ chordæ æqualis craſſitiei & longitudinis eodem pondere, ut utræque ad invicem uniſonum ſonent: tum ſicuti ſe habet chorda ad chordam, & pondus ad pondus intenſivum, ita ſe habebunt vibrationes ad ſe invicem: quoniam itaque chordæ ſunt æquales, eæ æquali tempore æquales vibrationes perficient.* Thence he goes on, by the diviſion of ſtrings, and a due application of weights, to give diapaſons, diſdiapaſons, *&c.* as you will better find in the book itſelf.

I WAS but yeſterday with Mr. *Thompſon*, who uſes to acquaint me with the new books that come abroad; but he neither then, nor afore, told me any thing of *Galilæo*'s ſecond tome: but I ſhall aſk him about it, God willing, the next time I paſs that way.

I AM very glad, that I have not been ſo forward, as ſome of my correſpondents would have had me, in diffuſing the wonders, ſaid to be performed by *Graterix*, into all parts of the world; and that with my own aſſeverations of the truth thereof; for I find your intelligence much differing from mine; though, indeed, I heard lately, that this healer did fail in ſome cures, but that it was about ſuch perſons, as had their ſinews quite withered, and their vitals totally deſtroyed, and the balls of their eyes loſt; and that therefore himſelf did ſadly complain over, and much commiſerate the ill adviſed journies of ſuch perſons, ſaying, that God had given him the gift of healing, but not creating limbs. By the very laſt, I received this information, that a child in Dr. *Beale*'s neighbourhood is cured of the ſtone, or other ſtoppage of urine, which came all, as he ſaith, with horrid pain, in threads, or ropy; but now, after the touch, is very perfectly natural, and without pain. Having related this, he adds, It cannot be denied, that innumerable great cures are done, and it is not poſſible, that all expectations ſhould be ſatisfied, without a general reſtoration, equivalent to a reſurrection. And then he concludes, that the ſame muſt ſuddenly fall, becauſe it is odious to many, and winter hinders the paſſage, and himſelf is tired with the infinite reſort, and men's expectations.

I HAVE heard the like, you are pleaſed to mention, concerning the effects of ſpirit of hart's-horn, of M. *Whitaker*, who is, perhaps, the young practitioner about *London*, you hint in your letter. But I do not underſtand, upon what account the ſulphur aur. diaphoreticum, being a vomit, as you intimate, ſhould be a ſafe medicine for the plague.

I HAVE here inſerted M. *Serrarius*'s own note of what is deſired at preſent for the copying of M. *Borrel*'s papers; you may do as you think fit: I have, in the mean while, written to him, that I have acquainted you with it, and that I doubt not, but you will give all reaſonable ſatisfaction for the pains taken in this matter. I have likewiſe encloſed M. *Auzout*'s printed paper, containing his cenſure of the Hevelian obſervations of the firſt comet, to the end, that our Oxonian members comparing both together, may be the abler to judge of the controverſy; concerning which, our preſident writes thus to me, in a letter (written on board of the Dutch Slothany prize) which came to my hands yeſterday: "I ſhall peruſe *Hevelius*'s "book you ſent me, and give you ſome "account of it; but it will be convenient, I "firſt ſee what M. *Auzout* objects, and not "amiſs too, to know the ſenſe of our mem-"bers at *Oxford*, the ſame being likely alſo "to be my opinion, and then my aſſent only "will ſave me further trouble; and if we "differ, it were fit to reconcile them firſt,

"before

" before a return be made to *Hevelius*. I a-
" gree with you, that it were not fit to return
" for anſwer, that the diſcontinuance of our
" uſual meetings, during the plague at *Lon-*
" *don*, incapacitates the Society to give their
" opinion of it, without ſending, at the ſame
" time, the judgment of thoſe you mention."
Sir, theſe perſons were, yourſelf, Sir *R. Moray*, Sir *William Petty*, Dr. *Wallis*. And you ſee, by this, how neceſſary it is, that this printed paper ſhould be with ſpeed peruſed and conſidered by the Oxonian club, that ſo it may quickly be returned hither for his lordſhip. On Saturday laſt I gave notice to Sir *R. Moray* by the poſt, that I had then ſent away two of *Hevelius*'s books for *Oxford* by a barge, whoſe owner is one Mr. *Moiſe*, carrying ſeveral things belonging to the duke of *York*, and prince *Rupert*, the duke's confectioner going along with it. I hear, the barge ſtays five miles ſhort of *Oxford*, and that there other conveyance is provided to carry it to *Oxford*; as alſo, that my roll is put up with the duke's goods. I doubt not, but Sir *Robert* will enquire, and take care, that it may be delivered to Dr. *Wallis*, who is moſt concerned therein. In the ſame letter to Sir *Robert*, I took notice to him of what a certain odd philoſopher (whom you know better than he, it being ſignior *Spinoza*) hath very lately written to me concerning M. *Huygens*'s tranſmigration into *France*, his pendulums, and his progreſs in diopticks, *&c.* The ſame *Spinoza* expreſſes a very great reſpect for you, and preſents you his moſt humble ſervice, and is diſpleaſed, that the Dutch ſtationers will, in ſpight of our teeth, ſell off one of their own Latin impreſſions of their hiſtory of Colours, before the tranſlation, made here, can be ſent thither.

To give you an extract of what he is thinking and doing, he writes thus; *Gaudeo, philoſophos veſtrates vivere, ſui ſuæque reipublicæ memores. Quid nuper fecerint, expectabo, quando bellatores ſanguine fuerint ſaturi, &, ad vires nonnihil inſtaurandas, quieverint. Si celebris ille irriſor hæc ætate viveret, riſu ſanè periret. Me tamen hæ turbæ nec ad riſum, nec etiam ad lacrymandum, ſed potius ad philoſophandum, & humanam naturam melius obſervandam, incitant. Nam nec naturam irridere, mihi fas exiſtimo, multò minùs ipſam deplorare, dum cogito, homines, ut reliqua, partem tantùm eſſe naturæ, meque ignorare, quomodo unaquæque pars naturæ cum ſuo toto conveniat, & quomodo cum reliquis cohæreat; & ex ſolo hujus cognitionis defectu reporio, quòd quædam naturæ, quæ ita ex parte & non niſi mutilatè percipio, & quæ cum noſtra mente philoſophica minimè conveniunt, mihi antehac vana, inordinata, abſurda, videbantur: jam verò unumquemque ex ſuo ingenio vivere ſino, & qui volunt, profectò ſuo bono moriantur, dummodò mihi pro vero vivere liceat. Compono jam tractatum de meo circa ſcripturam ſenſu; ad id verò faciendum me movent, 1. Præjudicia theologorum; ſciò enim, ea maximè impedire, quò minus homines animum ad philoſophiam applicare poſſint: ea igitur patefacere atque amoliri à mentibus prudentiorum ſatago. 2. Opinio, quam vulgus de me habet, qui me atheiſmi inſimulare non ceſſat: eam quoque averruncare, quoad fieri poteſt, cogor. 3. Libertas philoſophandi dicendique quæ ſentimus; quam aſſerere omnibus modis cupio, quæque hîc ob nimiam concionatorum authoritatem & petulantiam utcunque ſupprimitur. Nondum audio, Carteſianum aliquem ex Carteſ. hypotheſi, nuperorum cometarum phænomena explicare; & dubito, an ex illa ritè explicari poſſint.*

MONSIEUR *du Son*, being the other day at my houſe, where we talkt at random of many things, told me, among the reſt, that he had known the blind man at *Maeſtricht*, that ſees colours with his fingers ends, and had converſed with him a good while, during which, he had ſeen him play at cards, with better ſucceſs, than any man he played with; as alſo, to diſtinguiſh men and women from one another, by feeling their hands, or necks, and to diſcriminate the ſeveral colours of hair; and, laſtly, to diſcern the beauty of women by their voice.

OF ſtate news, we have the following particulars; that the whole Dutch fleet is come to *Solebay* for a bravado, our fleet being not there: that the French auxiliaries are upon their march, to join with the Holland forces againſt *Munſter*: that the French king hath given order to buy up 40000 new muſkets: that the king of *Spain* hath been dead theſe ſix months, and that, when they told us, ſome weeks ſince, of his being a ſpectator of a bull-baiting, it was his effigy, that looked on, ſo artificially made, that it moved *quaquaverſum*.

I PRAY, Sir, oblige me, by quickening our friends to peruſe this printed paper, that I may have it again ſpeedily; for I am unwilling to have M. *Hevelius*'s patience tried too long. I reſerve my writing to Sir *R. Moray*, till Thurſday, to whom, I pray, my humble ſervice. I heard not from him, when I did from you laſt.

London, Oct. 17, 1665.

SIR,

SELF-INTEREST makes me ſorry, you were laſt time hindred of the favour you intended me, of taking notice of more particulars of mine, than you did. I wiſh you more leiſure the next time for accompliſhing your intentions, that cannot be but very advantageous to me; and, in the interim, return you my humble thanks for thoſe informations you were pleaſed to impart to me, concerning the experiments of the tobacco poiſon, and that other, which, becauſe the chief word of the paragraph, relating of what kind that experiment was, had ſome odd ſtrokes paſſing through the letters thereof, I can only gueſs, by the context, to have been ſome mercurial one. You may be ſure, Sir, wherever I mention any thing, coming from you, I ſhall do you right; and, as I have mentioned in my next Tranſactions, ſome particulars, you have been liberal to impart, ſo I intend,

I intend, God willing, to do in the following, without omitting in either the fountain, whence I received it. I ſuppoſe, you did not think, when you gave an anſwer to my laſt, that I would ſo ſoon need that copy I begged of you, concerning the burning-glaſs of *Lyons*; but I have all ready for the next papers, to be printed, if God permit, the firſt Monday of November, and ſhould have ſent them by this very poſt, that they might come time enough, to be reviewed by my Oxonian friends at their leiſure, before their entring the preſs; but that I want that French copy to put it into Engliſh, having left a blank for it in thoſe papers. I beſeech you, therefore again, to favour me with giving your ſervant order to tranſcribe it for me, and to ſend it hither by the next poſt, by which I may receive it on Friday next, and ſo tranſmit my papers the very next day, as I wrote to Sir *R. Moray* I would do.

I WONDER ſomewhat, I hear nothing of the arrival of my roll, containing the prodromus, it going away from hence October 7. But, I believe, that ſome copies thereof were ſent by Mr. *Thompſon* to *Oxford*, before mine went; ſo that thoſe, who will take the pains of peruſing it, and compare both, may find the book at ſome ſtationers in the town, where you are.

AT this preſent I have no news, neither philoſophical, nor other, no letters being come to me, ſince my laſt, but Dutch, which ſpeak of their triumphs over ſome colliers and fiſhermen, as alſo of more ſtories from *Mecca*, confirming the former. Some mention is alſo made therein of the biſhop of *Munſter*'s diſturbances and miſchiefs he gives to the Dutch people in ſeveral parts. What is added of the rumour, as if the French king were killed by a ſhot, is here looked upon as fabulous, our laſt letters mentioning not a word of ſuch an accident; whereas I am ſure my correſpondent, from whom I then received two letters, would have given notice of it to,

SIR,

your faithful humble ſervant,

H. O.

WE hope for a decreaſe of 1500 this week; which God grant.

London, Oct. 31, 1665.

SIR,

THE unexpected favour of your letter this week, obliges me to a ſpeedy acknowledgment, which I return to you the more cordially, becauſe of the frankneſs therein expreſſed, of reſcinding ſome things of the Tranſactions, concerning which, the more freedom you and my other friends do uſe, the more obliging and ſatisfactory it will be to me. The ſtereometrical balance being mentioned immediately after your taking notice of the hydroſtatical papers being ready to go to the preſs, induced me to believe, that it was to be inſerted there. I heard nothing from Dr. *Wallis*, whom you ſeem to mention as inclined to write me ſome account of the ſaid Tranſactions: and it is almoſt a fortnight ſince I received any thing from Sir *R. Moray*, ſince which time I have ſent him ſeveral packets, both from others and myſelf. I hope he is well, and then I am ſure he will not forget me, though he be not in *Oxford*. I ſhall be very glad to ſee the book of injections, and ſhall then be better able to ſay what is fit, on the behalf of thoſe members of the Society, that had invented and practiſed the ſame way before any others known to us. And it would not be amiſs, if I might receive the information of ſome particulars, concerning that matter, of which, I think, I ſhall meet with nothing in your Uſefulneſs, *&c.*

IN my laſt I received from *Paris* what follows: *icy une perſonne, qui à travaillé à l'hiſtoire de l'Academie, , qui eſtoit compoſée de pluſieurs habiles gens: A Porta en eſtoit, et un Terrentius, et Molitor, qui à fait quantité d'obſervations touchant les animaux, dont on à quelques fragmens. S'il avoit trouvé en libraire, qui luy voulut faire une honeſte reconnoiſſance, il luy donneroit ſa copie, qui eſt preſque achevée. Il y parle de l'eſtabliſſement de cette academie, de ſes ſtatuts, des deſſeins du prince Ceſi, qui en eſtoit le chef, et* qui vouloit eſtablir des ſocietés par tout le monde, meſme en Afrique et en Amerique, à fin que d'eſtre bien informé de ce qui ſe trouve dans ces pais la: (this, methinks, the king ſhould know, if he does not already.) *Il parle auſſi de l'eſprit des academiciens, et de leurs ouvrages, et ne dit rien que ſur de bons memoires, qu'il à eus à Rome. Il à outre cela, un traité intitulé,* Philoſophia naturalis variorum, *que ne contient, que des obſervations faites ſur les choſes naturelles par des modernes. Il en à fait auſſi luy meſme, qui ſont curieuſes. Je l'obligerois à donner tout cela au public, ſi j'avois trouvé un libraire, qu'en voulut entreprendre l'impreſſion, et payer pour la copie. C'eſt homme là eſt grand ami de Redi, autheur du traité de la vipere, et de Tilman, ce grand anatomiſte, qui eſt au duc de Florence, comme auſſi d'un Corneli, qui à fait* Progymnaſmata Phyſica, *comme je vous manday par une de mes precedentes.*

I THINK I ſhall anſwer to this, that if the perſon, that is writing theſe things, and poſſeſſes theſe manuſcripts, be of repute, and the written papers compoſed by ſuch men alſo, printers cannot be wanting in this curious age, to publiſh ſuch matters.

I DOUBT Mr. *Sprat* muſt not know, that ſuch a relation is coming abroad of an Italian academy, for fear it ſhould yet more ſlacken his deſcription of ours, by begetting in him a curioſity to have a view of that for ſome advantage or other to this.

DR. *Beale* mentions, that in the late great ſtorms, Oct. 15. and 31, being the laſt day in the evening, his ☿ was ſubſided half an inch lower than has been theſe two years.

HAVE you heard nothing of the verſes made to the Royal Society, of which I had only ſent me the firſt ſtave, as follows:

Heroic conſtellations, diſpenſe
One ray of your celeſtial influence,
That with this teleſcope I may deſcry
The ſacred treaſures of your panſophy,
Elſe lockt up from the very Lyncean eye, &c.

I am promiſed the reſt, if my friend can get the true copy. The author ſubſcribes, I hear, *Galeazzo Victorio Villano di Stato*; and I hear there are twenty ſix ſtaves in all, in which they are taſked to the full, and without reproach.

I HOPE my lady *Angleſey*, and Mr. *Southwell*, are in *Oxford*, to receive thoſe letters I gave you the trouble of laſt week.

I WONDER I hear nothing yet of the roll with the Prodromus, and that the more, becauſe I underſtand, the man, that carried it, is already come back to *London*.

WE are much afraid here, that theſe Munſterian forces, that went into *Groninguerland*, are in great danger to be drowned there. And as to the ſhips taken and ſunk by the French, we ſay here, that they were carrying proviſion into *Tunis*, their enemies, and that one of them not only refuſed to ſtrike, being but a merchant, but alſo let fly a broad ſide againſt the French.

THOUGH the non-conformity preachers are ſaid to be baniſhed out of the corporations by act of parliament, yet they have great liberty at preſent here in *London*, many of them preaching publickly in ſeveral pariſh churches, *nemine contradicente*. It ſeems the governors of the land care as little to hinder the ſectary miniſters from preaching, as phyſicians do to keep apothecaries from practiſing phyſick.

I AM glad the count of *Waldeck* is taken off, he being a very good commander, both for conduct and action.

THIS is all at preſent from,

SIR,

your faithful humble ſervant,

H. O.

London, Nov. 21, 1665.

SIR,

SEEING you do not appoint me to addreſs my letters to you otherwiſe than I have done, though you withdraw to another place, I continue the former, not doubting, but it will come ſafely to your hands. I am ready to receive what ſhall be printed off, of your Hydroſtatical Paradoxes, if you pleaſe to ſend it, as you propoſe. I find Mr. *Huygens* is very buſy in making trials of optick glaſſes by a very fine engine, I hear, he has lately cauſed to be made for the purpoſe; but I heard nothing more concerning the book of Colours in *Holland*, though I had lately another letter from Signior *Spinoza*, who is very much your ſervant, and who entertains me with a diſcourſe of his concerning the agreement and coherence of the parts of the world with the whole; which is not unphiloſophical in my opinion, though it would perhaps be tedious to you to have a letter filled with it; and this makes me forbear to ſend it you. It is an ill omen, methinks, that the very firſt experiment ſingled out by us out of *Kircher* fails, and that it is likely the next will do ſo too. If it had been convenient for you, to have ſent me your obſervation about oaker, I ſhould have owned the favour, unleſs you had forbid me, in my next Tranſactions, which are almoſt ready to be ſent to Dr. *Wallis*.

THEY write me from *Paris*, that Monſieur *Voſſius* is at the preſent employed in writing a tract of the Origin of the Nile, in oppoſition to that Monſieur *de la Chambre*, who is opiniatre in maintaining, that the nitre is the principal cauſe of the inundation of that river. One Monſieur *de Farges* hath written a book *de l'Eſprit*, which I ſhould be glad to ſee, the author being a Carteſian; but patience till the commerce be revived.

MONSIEUR *de Son* has made ſome progreſs in his parabolical glaſſes. Monſieur *Auzout* has communicated to me his ſpeculations of the changes, likely to be diſcovered in the earth and moon by their reſpective inhabitants; and ſomewhat of a way he hath invented, to meaſure, by the means of a teleſcope, diſtances of objects upon the earth, by one ſtation, without the uſe of any other inſtrument. And out of *Germany* a friend hath ſome particulars imparted to me of ſalt ſprings, and of an odd ſpring in *Weſtphalia*; of which my next Tranſactions will give an account; where I alſo make a narration of the riſe and attempts of injections into veins, taking aſſiſtance from what you have recorded of that matter in your Uſefulneſs of experimental philoſophy; but wanting the preciſe time, when it was firſt ſtarted by Dr. *Wren* at *Oxford*, which if you do remember, or any of your friends, I pray let it be expreſſed, and corrected what I may have erred in, who have ſet down, that it is about ſix years ago, when the firſt mention of it was made in *England*, long before any others, as far as we know, thought on ſuch a thing. If I had had my own book, I lent to Dr. *Clerk*, and that which you had lately from *Hamburgh*, I ſhould have been a little more particular in that buſineſs; but I hope, what I have ſaid, will be ſufficient.

FOR ſtate-news, I can tell you, that *France* ſeems to careſs *Spain*, having lately ſent to *Madrid* an envoy, M. *de Belſont*, to declare, that the king will keep the treaty between the two crowns; which looks like a trick, to divert *Spain* from being too great with *England*. Though the French be generally for the Dutch, yet there are ſome, that wiſh very well to the Engliſh; and I hear, that libels have been lately ſcattered at *Paris*, importing, that the government of *England* is far to be preferred to that of *France*, and that it were better for them to declare for the king

of *England*. The ſame letter mentions, that the Dutch, who are at *Paris*, ſay, that *France* hath done them more miſchief, than good; for, if they had not been aſſured by them of ſea and land aſſiſtance, they had never begun the war. From *Bourdeaux* come high compliants, that their wines muſt lye this year upon their hands, there being no Dutch ſhips come or coming to fetch them away; which will certainly vex both the gentry and merchants extremely, whoſe eſtates, principally in thoſe parts, do for the moſt part conſiſt in wines.

ANOTHER letter from *Paris* mentions, that my lord St. *Albans* is coming over with new propoſitions for peace; and that the king of *France* thinks himſelf ſure of the Swedes, having augmented their penſion by 200,000 crowns *per annum*. It adds, *que le duc de Luneburg à declaré, qu'il ne vouloit point prendre le parte d'un preſte, quien hazardant tout, ne hazardoit rien du ſien.* This is an inſtructive conſideration in the opinion of,

SIR,

your very faithful humble ſervant,

H. OLDENBURG.

SIR R. *Moray* mentions, that I ſhould receive Mr. *Auzout*'s letter from you.

London, Dec. 5, 1665.

SIR,

THOUGH I have received the favour of your letter from Dec. 1. yet I have not ſeen thoſe two ſheets, which you therein mention, of the Hydroſtatical Paradoxes, nor that printed letter of M. *Auzout*'s, which, a fortnight ſince, Sir *R. Moray* told me it was in your hands; whence I was to receive it for my lord *Brounker*, in order to compare it with the Hevelian Prodromus. I think it will be moſt convenient every way, to remit Signior *Spinoza*'s diſcourſe *de conſenſu partium*, till our perſonal interview, which, I hope, the goodneſs of God will grant us ere long, the bills decreaſing more and more very comfortably. I humbly thank you for Dr. *Beale*'s letter, and I doubt not, but you ſaw a copy of the ſwelling verſes made upon our Society, and containing a bundle of big interrogatories, which did put me in mind of the old ſaying, that one fool can make more queſtions, than ten wiſe men can anſwer. But I will paſs to my philoſophical intelligence.

TAKE this, if you pleaſe, from *Rome*: *Campani* hath had the advantage over *Euſtachio de Divinis*; the great duke of *Tuſcany* and prince *Leopold*, after they had tried both, found thoſe of *Campani* better; with one whereof they ſaw men at four leagues diſtance, and diſtinguiſhed them eaſily. *Riccioli* is buſy at his Aſtronomical Tables. The Jeſuit *Grimaldi* has made a treatiſe *De Lumine et Coloribus*. *Redi* hath made other experiments of vipers ſince he publiſhed his book upon that ſubject; and hath obſerved, that thoſe herbs, which are ſaid to be mortal to them, are not ſo; but that ſalt and ſugar are. [I pray, Sir, if you have the convenience of trying this with ſalt and ſugar, let it be a part of your divertiſement, and oblige me to acquaint me with the ſucceſs.] Farther, at *Florence* they have been making experiments upon ſalts, and found, that the figures of them in each herb are different. And as to their experiments ſo long talked of, I now hear, that they will not be printed yet theſe four or five months. The book of vipers is printed at *Paris* in Italian, and I am promiſed it, with other things, at the firſt opportunity of ſending.

As for ſtate news, I ſhall give it you, as I received it lately from *France*: *Il y a un livre, dont l'autheur ſe veut mocquer des Hollandois et de François, parlant du roy aſſez librement; mais je ne le trouve pas bien ſpirituel. On croit, qu'enfin vous nous ferez la guerre; on s'y attend, et on s'y prepare. Les Hollandois de leur coſté s'y reſolvent, aimants mieux faire la guerre avec la France contre tous, que de faire une paix deſadvantageuſe, et dependre des Anglois. On ne parle icy que de milions et de ſommes ſi exceſſives, que ſi je vous les diſois, vous ne croiriez pas, que dans toute l'Europe il y eût tant de bien. Il eſt certain, que la France a des grands avantages a preſent: un roy jeune et entreprenant; point d-favory, pour cauſer des cabales; abondance d'argent, et partant de toutes choſes; un roy d'Eſpagne, et un empereur, foibles et pauvres tous deux.* (I confeſs theſe advantages are important, and to be conſidered.) *On a affiché au palais du roy d'Eſpagne, devant qu'il mourut, cette* Paſquinade: *el prencipe eſta malo; el rey es de palo; l'infanta ſe caſa: quien al quila eſta caſa.* You need no interpreter, nor, I hope, any aſſurance of my being,

SIR,

your very humble and faithful ſervant,

H. OLDENBURG.

P. S. I intreat, you, Sir, do me the favour, and impart to me your thoughts of the thriving of the mathematical or Carteſian philoſophy in our univerſities, whether there be not now more of the young pregnant men, that reliſh it, than formerly.

I DO intend, God willing, to write very ſhortly to Sir *John Finch*: if you pleaſe to command me any ſervice to him, I am ready to receive and to convey it.

I HUMBLY thank you for your intention of retrieving the *Hamburgh* book for me, and of communicating the obſervations about oaker, and the employments where now you are.

SIR,

London, Dec. 19, 1665.

SIR,

I SHALL begin this with taking notice of what you conclude your laſt with, concerning Dr. *Beale*'s barometrical obſervations. Theſe I received not, till after my laſt to you; and it ſeems, that our friend would have notice given to the publick of the baroſcope, in the Tranſactions; yet not without offering it firſt to your advice and directions. He intends then to ſend to you his calendar and ſome reſults, that they may be compared with Dr. *Power*'s calendar, and others of the ſouthern diſtance from him (Dr. *Power*) and the eaſt, from himſelf; that ſo it may be diſcovered, whether the air gravitates more in the eaſt, or weſt, north, or ſouth; towards ſea or land; in hotter or colder weather; and keeps the ſame ſeaſons of changes; and by this publication, to awaken others to explicate the phænomena, yet in the dark.

AFTER this, he abbreviates to me ſome particulars, viz.

" 1. MY wheel-barometer (ſaith he) I could " never fill ſo exactly, as to exclude all air, and " therefore I truſt more to a mercurial cane, " and take all my notes from it. It is but " 35 inches long, of a very ſlender cavity, " and thick glaſs. This may eaſily be con- " veyed to any place for trials. The mercu- " rial veſſel is about two inches wide; the " mercury ſo well filled, that for ſome days " it would not ſubſide, but hung to the top " of the glaſs-cane. I keep it in a cloſet, " pretty cloſe, 9 foot high, 8 foot broad, " 15 foot long, near a window. This I note " (ſaith he) becauſe poſſibly the cloſeneſs of " the room may hinder, that it gives not " the full of all changes, as it might in more " paſſable air.

" 2. IN all my obſervations, from May 28, " 1664, to the preſent, the mercury never " aſcended but very little above $30\frac{1}{4}$ inches.

" 3. IT aſcended very ſeldom to $30\frac{1}{4}$ inches, " chiefly in Dec. 13, 1664, the weather fickle- " fair, in the evening.

" 4. IN my calendar of June 22, 1664, I " find at five in the morning, in a time of " long ſettled fair weather, the mercury had " riſen about $\frac{1}{4}$ an inch higher than 30; but " I fear ſome miſtake, becauſe I then took " no impreſſion of wonder at it; yet for three " or four days, at that time, it continued " high in well ſettled, fair and warm weather, " moſt part above 30 inches; ſo that I may " note, the mercury to aſcend as high in the " hotteſt ſummer weather, as in the coldeſt " winter weather.

" 5. YET ſurely I have noted it to aſcend " a little higher for the coldneſs of the wea- " ther; as very frequently, both in winter " and ſummer, to be higher in the cold morn- " ings and evenings, than in the warmer mid- " day.

" 6. GENERALLY, in ſettled and fair wea- " ther, both of winter and ſummer, the " mercury is higher, than a little before, or " after, or in, rainy weather.

" 7. AND generally it deſcends lower after " rain, than it was before rain.

" 8. GENERALLY alſo it falls in great " winds, and ſomewhat it ſeemed to ſink, " when I have opened a wide door, to let in " ſtormy winds. Yet I have found it to " continue very high in a long ſtormy wind, " of three or four days.

" 9. AGAIN, generally it is higher in an " eaſt and north wind (*cæteris paribus*) than " in a ſouth and weſt wind.

" 10. I TRIED ſeveral times, by ſtrong " ſumes and thick ſmokes, to alter the air in " my cloſet; but I cannot affirm, that the " mercury yielded any more, than might be " expected from ſome increaſe of heat. Such " as have exact wheel-barometers, may try, " whether odors or fumes do alleviate the " air.

" 11. IN this cloſet, I have not, in all this " time, found the extremeſt changes of the " mercury to amount to more than $2\frac{7}{8}$ inches; " of $2\frac{3}{4}$ inches, I am full ſure." So far our obſerving friend.

SIR, if you think, that the publiſhing of ſuch particulars as theſe may aſſiſt to excite others to make the like obſervations, and ſhall pleaſe to inſtruct me with the orders for bounds and method in the publiſhing, I am moſt ready to follow your directions; though, I confeſs, Mr. *Davies* wrote me, the other day, ſo heavy a letter, that it would very much ſlacken any man's pace in continuing ſuch labour. For he tells me, that, of the firſt Tranſactions, he printed, he then, when he wrote (Dec. 16.) had not vended above three hundred; and that he fears, there will hardly ſell ſo many, as to repay the charge of paper and printing: ſo that, it ſeems, my pains and trouble would be of no avail to me. Yet he concludes, that, notwithſtanding theſe diſcouragements, if you and I do think fit to have any more printed at *Oxford*, he will readily ſerve us in the managing thereof, and the preſent diſburſing of the charge; intimating withal, that he undertook to print theſe papers, and to give the author, as his friends had propoſed, yet provided, he might be ſecured from being a loſer by it.

WHAT to ſay to this, I know not: if Mr. *Davies* give over, it will look very ill; and if he continue, I muſt ſuffer very much there too. He thinks, *London* being like to be open now for commerce, if he do ſend to three or four active ſtationers, in ſeveral quarters of the town; and beſides to *Cambridge*, *Exeter*, *Briſtol*, *&c. item* into *Ireland*, *Scotland*, a far greater number ſhould then go off: but if he be not a man of an active and large correſpondence, I had done much better, never to have committed it to him. He ſhould, when he ſends copies to Mr. *Thompſon*, ſend ſome to a good bookſeller about the *Exchange* (for there, I find, they are enquired after) and to another about *Dunſtan*'s in *Fleet-ſtreet*, and to another about *Weſtminſter*: and ſo diſperſe them

them to the chief parts of the city, eſpecially now carriers begin to return hither. Before I received this dull letter of his, I had already diſpatched away to Dr. *Wallis* my manuſcript, for the month of January; which, I think, he muſt print; but if in the interim he ſpeed not better, we muſt then conſider of another expedient, or let it fall. I am afraid, there being a kind of conjuration, and a very myſtical one, among ſtationers, and *Alleſtry* having taken a ſnuff, he does, it may be, ſo collogue with *Davies*, that, by not forwarding the vent of theſe Tranſactions, they may bring down the price to their lure. I muſt aſk your pardon, for troubling you with ſo faſtidious a ſtory; concerning which, I am willing to ſubmit to the advice of my friends. I have not yet received any ſheet of your hydroſtatical papers, nor a penny from Mr. *Davies*, beſides the five pounds you were pleaſed to make over for me.

SIR, I doubt, I ſhall not be ſo happy, as to receive a particular advice from you, touching this troubleſom buſineſs, ſeeing it muſt paſs through the hands of an amanuenſis; yet, though it be given a little ænigmatically, I truſt, I may find out the meaning.

THE performance of Mr. *Reeves*'s glaſs, of ſeeing the ſhape of windows, and the differing colours of the ſtones, and the weather-work upon the *Harrow*-ſteeple, I ſuppoſe to have been done by his ſixty foot glaſs; but, I believe, that of *Campani*'s, tried at *Florence*, was not above thirty five foot; whereof I expect more particulars ſhortly. As to the ſale of his longeſt glaſs to ſome virtuoſo abroad, that is not like to be, becauſe himſelf has obſtructed it, by what I find printed by Mr. *Auzout*, who ſaith, that, a while ago, a perſon of ſome quality having told *Reeves*, that at *Paris* there were glaſſes, drawing the ſame length with his, that did bear a greater aperture, & *des oculaires plus forts* (leaving him thereupon to judge, whether they were better) that perſon received no other anſwer from him, but that his glaſs was exceeding good, and that thoſe, who did not think the ſame, ſhould not think to have any of them. In the ſame place, the ſaid Mr. *Auzout* takes notice, that the teleſcope, ſent by his majeſty to the duke of *Orleans*, made by *Reeves*, bears no more aperture, than two inches and three lines French; and that that of the ſame *Reeves*, of ſixty foot, bears not much above three inches aperture; whereas his (Mr. *Auzout*'s) glaſs, of twenty one foot, has commonly two inches four or ſix lines aperture, French meaſure (which you know does ſomewhat exceed the Engliſh;) and another of his, of fifteen foot, bears two inches, which latter is the aperture of *Reeves*'s glaſs, of thirty foot long.

I AM ſorry I had not the favour of your laſt letter ſoon enough, to take notice of what you ſuggeſt, concerning your ſuſpenſion of making further experiments of cold, this winter, in the next Tranſactions, the manuſcript whereof I had ſent away two days before, making the more haſte, that it might be printed off before the feſtival days. If they be continued, the next to theſe may ſeaſonably enough, I think, make mention thereof.

I WRITE this very day to my lord *Brounker*, to ſend to him Mr. *Auzout*'s letter, together with your ſalute. I hope his lordſhip will now ſhortly be in town again, which fills apace; and the like I do of Dr. *Wilkins* and others. Did not I underſtand, that your book *De Origine qualitatum* was alſo begun to be printed? I long to hear, what ſubject of devotion you are employed upon, as alſo, what work Dr. *Wallis* has in hand; and am glad, you have retrieved thoſe philoſophical papers about ſenſation and occult quantities, &c. I met the other day, in the Aſtrological diſcourſe of Sir *Chriſtopher Heydon*, with an experiment, which he affirms to have tried himſelf, importing, that cold accompanies reflected light, by employing burning ſpherical concaves, or parabolical ſections, which, he ſaith, will as ſenſibly reflect the actual cold of ſnow, or ice, as it will the heat of the ſun. I would fain have this come *ex ore duorum aut trium*, the ſole teſtimony or affirmation of ſo deep an aſtrologer, as that gentleman was, being not likely to be received by ſevere philoſophers.

No letters came from *France* to me, ſince my laſt; but I hear from others, that they will make up a war fleet of thirty ſail for next ſummer, and that that king relies ſo much upon his money (which he thinks to exceed three or four times the treaſury of our king) and the ſtrength and number of the Dutch ſhipping, and the conjunction of *Sweden* and ſome German princes, that he ſhall be able to tire *England* out, whom he believes not capable to continue a long war. Our Eaſtland fleet, of thirty ſeven merchant-men, and ſeventeen men of war, is now come home, very well, God be thanked, laden with ſtore of naval ammunitions. A good ſquadron of Engliſh frigats are ſhortly to ſet ſail for the *Streights*, where they will find work enough, in the perſuaſion of,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, Dec. 30, 1665.

SIR,

YOUR laſt ſpeaks ſo much favour and care for my concerns, that I cannot write of any thing before I have given you the aſſurance of my humble and hearty acknowledgments, which I hope I ſhall have occaſion ſo to demonſtrate the realneſs of, as to convince you, I hate ingratitude.

I SHALL not trouble you with repeating here, what I ſaid on Tueſday laſt to Dr. *Wallis*, about the printing of the Tranſactions for the month

month of January, becauſe I find by your letter, that you did intend to be on that, or the next day, at *Oxford*, where you are likely to receive that trouble from my letter to the ſaid doctor. I wiſh only, there be no colluſion among the ſtationers, and that the deadneſs of trade and correſpondency, into which the reaſſuming of the printing of thoſe papers is fallen, may not prove too great a prejudice to the diſperſing of them for the future.

ON Thurſday Mr. *Hatherton* brought me the four pound, for which I gave him my receipt, and cannot but give you particular thanks; but am afraid, Mr. *Davies* will prove backward in repaying them. He ſeems to intimate in his letter to me, as if Dr. *Wallis* would bind him to that printer, who has hitherto done the Tranſactions, and as if the making uſe of another printer, who would duly ſupply him with copies, would conduce to the better diſperſing of them. I believe, if this were ſo, he might eaſily receive ſatisfaction in this point.

Mr. *Crook*, who was the other day in *London*, told me, that there were not above two hundred copies left of your Hiſtory of Cold, that he was ready to reprint the Sceptical Chemiſt, as ſoon as he could get men to work, many printers being carried away, among the reſt, by this ſad contagion, which, God be bleſſed, is now fallen to one hundred and fifty two.

I HAVE now received the ſix ſheets of your Hydroſtatical Paradoxes, which I have read with much ſatisfaction, as being very clear and inſtructive; and I ſpend now a part of my time in putting them into Latin; which if you think fit to have alſo printed at *Oxford*, and that with ſpeed, I am ready, from week to week to ſend you my ſheets, upon your order.

THIS very day I had an anſwer from my lord *Brounker* to my late letter to his lordſhip, and to Mr. *Auzout*'s printed animadverſions upon the *Hevelian Prodromus*. He ſaith, he cannot ground his opinion well upon what is in difference between thoſe two obſervers, until he ſees the laſt obſervations made by Mr. *Hook*, and what there are of February 18, or later; and he adds, that the difference depending upon matter of fact, it is the authority, number and reputation of other obſervers, that muſt caſt the balance. Thus far his lordſhip of this particular, which he concludes with returning his humble ſervice to you. Mr. *Hook* is now here, as well as Dr. *Wilkins*; and I find, that the former is not like at all to relieve *Hevelius* by his obſervations, extending to the 10th of *March*, which I have preſſed him to look out, and to communicate to thoſe perſons, that have read and conſidered both *Hevelius* and *Auzout*. This I intend alſo to acquaint Dr. *Wallis* with, by this very poſt.

MONSIEUR *de Son* hath now ready one of his new-faſhioned watches, furniſhed with a ſlender ſpring, inſtead of a pendulum, to regulate the balancer, which is ten times heavier, as he ſaith, than others, to command and bridle the wheels, and thereby to cauſe an equality in their motion. He tells me, he will, by the firſt conveniency, ſend it to his majeſty, having alſo one or two more in hand for the Duke of *York* and prince *Rupert*. He aſſured me alſo, the laſt time I ſaw him, that at his next viſit he would ſhew me his parabolical object-glaſs finiſhed; which I now, with great impatience, look for every hour.

FOR news of ſtate, I believe, Sir, you have heard ere this the diſcourſe, that fell out lately between the duke of *Albemarle* and the Dutch ambaſſador; the latter whereof, giving a viſit to the other, took occaſion to intimate to him, that, there lying upon him ſuch weighty affairs at land, he could ſurely not be diſpenſed with, to go to ſea. To which the duke is ſaid to have reſolutely anſwered, that if God granted him any meaſure of health, he would be with them before the middle of *April*, and ſee, whether they would do him reaſon. The ambaſſador replying, that he doubted not but his countrymen would acquit themſelves well, the duke made anſwer (as I was told by one, that ſaid he was preſent) that he would fight them any where, and give them the advantage of a fourth, both as to number of men, ſhips and guns; not doubting of the bleſſing of God againſt a people, that were ſo guilty of both ingratitude and breach of promiſe, the former being notorious to all the world, and the latter being alſo evident, by the not reſtoring of *Poleroon*. To which the ambaſſador replying, that the former charge was more eaſily made, than proved, and the latter did concern the Eaſt-India company, not the States General; the duke returned, that, as to the point of ingratitude, he was perſuaded, that they did find proof enough of it in their own conſciences; and as to the other, they were accuſtomed to it, to ſhift off from one to another the injuries they did to princes and other nations. Many other reciprocations there paſſed betwixt them, about the graſping of trade on one ſide, the want of money for carrying on a long war on the other, and the like, which would be too tedious for a letter.

IT is not unlikely, but ſome diſorders may ariſe in *France*, the prince of *Condé* being fallen into new diſcontents, and the king having lately by his declarations, in the Pariſian parliament, caſt a great conſternation into all ſorts of people, but thoſe, that are his creatures, and depend altogether upon his crown.

WE hear, the biſhop of *Munſter* is in a condition good enough, and hath more than once offered the enemy battle, which they avoided. The Lunenburg forces ſeeming to be backward for action, maketh many think, that the king of *England* hath good friends amongſt them, and count *Waldeck* himſelf.

SURELY I need not tell you from hence, what is ſaid here with great joy of the diſcovery of a north-weſt-paſſage, made by two Engliſh and one French man, lately repreſented by them to his majeſty at *Oxford*, and anſwered by a royal grant of a veſſel, to ſail into *Hudſon*'s bay, and thence into the *South-Sea*, theſe men affirming, as I hear, that with

a boat they went out of a lake in *Canada*, into a river, which diſcharged itſelf north-weſt into the *South-Sea*, into which they went, and returned north-eaſt into *Hudſon*'s bay. I hope, if this be truth, I ſhall receive the favour of your confirmation, together with a correction of miſtakes, as to the particulars.

I SEND here encloſed the ſequel of Dr. *Beale*'s barometrical obſervations, concerning which he will be very glad, as well as myſelf, to hear your judgment. I remain,

SIR,

your very humble

and faithful ſervant,

H. O.

The ſequel of Dr. Beale's *barometrical notes.*

1. VERY often I have found great changes in the air, without any perceptible change in the barometer; as in the dewy nights, when the moiſture deſcends in a great quantity, and ſometimes the thickneſs ſeems to hide the ſtars from us; in the days foregoing and following, the vapours have been drawn up ſo inviſibly, that the air and ſky ſeemed very clear all day: this I count a great change, between aſcending and deſcending dews and vapours (which import levity and weight) and between thick air and clear air; which changes do ſometimes continue in the alternative courſe of day and night, for a week or fortnight together, the barometer holding the ſame.

2. SOMETIMES (to this I ſay, not often) the barometer yields not to other very great changes of the air; as yeſterday (Dec. 18.) an extraordinary bright and clear day, and this day (Dec. 19.) quite darkened, ſome rain and ſnow now falling, the mercury the ſame. So in high winds, tempeſts, and calms, the ſame.

3. I DO conceive, that ſuch, as converſe much *ſub dio*, and walk much abroad, may find many particulars much more exactly, than I can undertake. To inſtance one of many; Saturday laſt (Dec. 16.) was a clear cold day, very ſharp and ſtrong eaſt winds, the mercury very near thirty inches high. About three in the afternoon, I ſaw a large black cloud, drawing near us, from the eaſt and ſouth-eaſt, with the eaſt wind. The mercury changed not that day, nor the day following; yet I laid a wager, the weather would change before the morning. The ſtars and moſt of the ſky were very bright and clear, till nine (Dec. 16.) and then ſuddenly all the ſky was darkened: yet I loſt my wager, no change of weather. Dec. 17, the froſt held, and a clear day; about two of the clock in the evening, many thick clouds low in the weſt; yet no change of weather (rain or ſnow) fell here: the wind, froſt and mercury the ſame. Dec. 18, the mercury fell almoſt a quarter of an inch, and the ſky and air ſo clear and bright and cold, and eaſt wind, that I wondered what could cauſe the mercury to deſcend. I expected, it ſhould have aſcended, as uſually in ſuch clear ſkies. Caſually I ſent my man abroad, and he diſcovered the remote hills, about twenty miles off, covered with ſnow. This ſeemed to diſcover, that the air being emptied of the clouds by ſnow, became lighter.

I PRAY you, take further notice for Mr. *Boyle*, that from Thurſday evening, to this preſent, *Dec.* 19, there has been a ſharp and hard forſt, the ice bearing the ſliding boys, and the froſt deep in the earth. This the country people here called a wind froſt. It was very cold within doors, as in great froſts, but no freezing within doors, or very little. Roſe-water did not freeze in my window; nor did any froſt or dew drops, in the leaſt, ſtick upon the glaſs in the windows. Tueſday, Saturday, and Sunday, the graſs continued green; Monday and Tueſday the graſs very white with froſt, yet no dew on the windows: not in a very little chamber, where four perſons lay near the window. This muſt be referred to Mr. *Boyle*'s examination, whether the freezing corpuſcles are more in force by the motion and agitation of the air and winds; and how far they paſs with the air. The air gets to my barometer, when the wind does not; and where the wind ſtrikes not much, the freezing is ineffectual.

I WISH alſo, that ſuch as have perfect ſcales, would try, whether mercury does not change its weight, or bulk, in ſome changes of air, and weather, cold, and heat, as by weighing it in a bladder, ſeveral times the ſame; and when the barometer does moſt of all diſappoint expectation; and at greateſt changes.

HENCEFORTH for ſome days I ſhall try another method upon the barometer, obſerving it, as it is before my eyes all day long, and eſpecially at all changes in the air and weather, *&c.*

THIS ſummer I had ſeveral ſmall funnels, of a ſmall hole at the bigger end, and a very ſmall ſhank, about eight inches long. I filled one with the oil or ſpirit of amber, the other with ſpirit of turpentine (both drawn, as it is commonly ſold, by the widow *Matthews*.) Other funnels I filled with ſpirit of wine, and then cloſed both ends with hard wax, to try, what the motion of amber and turpentine would be, compared with ſpirit of wine, to the purpoſe of Mr. *Boyle*'s note, in his Hiſtory of Cold, p. 63. I met with many diſappointments, but had them ſome ſummer weeks before my eyes in my ſtudy window. And ſometimes I ſaw the amber ſtir by ſtarts, as by a ſpring, which I gueſſed to be cauſed by the viſcous adheſion to the pipe of the glaſs. I told you about that time of a black ſtuff in my ſealed thermometer, which hath diſagreeing motions, ſometimes in five parts, at much diſtance, ſometimes nearer in two parts, ſometimes in three, ſometimes cloſe together in one, *&c.* This I regiſtered in ſummer, and now in winter, and it is ſomewhat ſtrange to me.

London, Jan. 16, 1665-6.

SIR,

THE favour of your laſt, without any date of time or place, I received this day, and was very glad to find therein your approbation of what Dr. *Beale* has obſerved of the barometer; whereof if any thing be publiſhed in the Tranſactions, I ſhall, God willing, punctually obſerve the orders of your letter. I rejoice alſo, to underſtand, you are upon ſuch a book of devotion, as you have now been pleaſed to expreſs to me; ſuch treatiſes, ſolidly done, being too much wanting, to keep men in this curious and nice age from the diſreliſh of divinity. Mr. *Crook* being now returned for good and all, will be acquainted with what you mention about the printing of the Scept. Chemiſt, as ſoon as I ſhall paſs that way. The laſt time I ſaw him, he expreſſed deſire enough to go on in the printing of the Latin hiſtory of Cold, as ſoon as workmen could but be obtained, which of that trade have died in very great numbers. When the preſs is ready for the Latin of the Hydroſtatical Paradoxes, I hope not to be unready to comply with it. I am ſorry you had not a ſight of the manuſcript for the laſt Tranſactions, when it was in Dr. *Wallis*'s hands, that you might have ordered the title of the book of Forms, *&c.* according to your mind. But I may take occaſion hereafter, to accuſe myſelf for miſtaking the title. If the Tranſactions be printed at *London* again, (which yet is very doubtful, becauſe of the plague keeping ſtill on foot, and diſcouraging all ſorts of people from ſettling to buſineſs) you are like to find in the next ſome account of the particulars, contained in the Italian treatiſe of vipers, which has the reputation, I perceive, to have been compoſed with much care and accurateneſs. It ſeems, the author lodges that poiſon in the two veſicles, that are about the vipers teeth, and maintains by experiments, that all the wounds of animals, that he rubbed with the liquor, contained in thoſe bags, proved mortal. But I refer to the print. From *Paris* I did lately receive an experiment, made of the lungs of a human fœtus, which I ſhall give you in my author's own words.

Un de mes amis ayant mis le poumon d'un fœtus dans un ſceau plein d'eau, ce poulmon eſt deſcendu auſſi toſt au fond, & en ſouffiant dedans il eſt monté au deſſus. Tous les poumons (ſo he goes on) *des autres animaux ne deſcendent pas, ce qui fait voir, que dans le ventre de la mere les enfans ne reſpirent pas, & que leur poumons n' agiſſent point.*

FROM *Amſterdam* I have an humble ſalutation for you from Mr. *Laurenz de Geer*, and Mr. *Serrarius*; the former whereof having lately received the whole remainder of the traſlation of the Old Teſtament into the Turkiſh language, entreats you to favour him with an anſwer to the following queries, for the encouragement of the printing that part of the holy Scriptures.

1. WHETHER in *England*, they print with vowels, or without?

2. How much is paid to the printer per ſheet; and whether the printer muſt pay the correctors?

3. WHETHER the Engliſh have alſo letters with vowels on top; and whether Mr. *Boyle* hath cauſed the letters to be cut or graven at his own charge; or whether the printer has paid them; and how many there are of them; and how much they coſt?

4. WHAT the paper amounts to?

5. WHAT number of copies are to be printed?

6. To ſend over one ſheet, as it is maculated with the corrections. This is, I ſuppoſe, a periphraſis of what we call a proof-ſheet corrected.

THESE things reſolved being likely to ſerve them for the better printing of the Old Teſtament, I doubt not, Sir, but you will give yourſelf the trouble of ſatisfying them therein.

M. *Serrarius* tells me, that he is watching for a ſafe conveniency to tranſmit Mr. *Borrel*'s copied manuſcript; but adds (which I am ſurpriſed at) that the account of the copies amounts to ſixty-ſeven gilders, and ten ſtivers, there being an hundred thirty-five leaves, each ten ſtivers. The three pounds, which you furniſhed, I have already ſent; witneſs his friend's acquittance, not only for that ſum, but for two pounds more, which I added, and would have made up the reſt, if I had been able. In the mean time, I have intimated to *Serrarius*, that it is a pretty big ſum for a writing not yet ſeen by us; and that he needs not doubt, after we have ſeen it, to receive all reaſonable ſatisfaction for it from hence.

I AM now caſting about, how I may procure for our aſtronomers here ſome perſon or other in remote parts, that would join their endeavours with us, for the finding out the true diſtance of the ſun and moon from the earth, by an agreement made on certain times between the two obſervators, furniſhed with good teleſcopes, prepared for that purpoſe, by a meaſuring rod placed within the eye-glaſs at a convenient diſtance, as will be more largely directed, when the ſaid correſpondency ſhall be procured. I have *Portugal* and St. *Helens* in my thoughts; but am afraid, the former is too near us, and the latter deſtitute of a fit apparatus. Yeſterday I wrote to Mr. *Hevelius* his doom, ſhewing my letter to our preſident, who fully approved of it.

To add the ſtate-news, I have only theſe French particulars.

1. *Les eſperances de la paix s'evanouiſſent, & on croit, que la rupture eſt aſſurée entre les deux couronnes. Cependant le nombre des malcontens augmente icy tous les jours à cauſe des taxes, qu'on fait paier aux gens d'affaires, & de l'evaluation, qu'on a faite des charges. Mais les peuples ne ſont jamais contens. Ceux, qui gouvernent, ne ſe ſoucient pas d'eux, pourvû qu'ils les craignent.*

2. *On leve icy des troupes, mais on aura de la peine à faire une armee comme celle qui a eſté caſſee: il faut plus de 20 ans de guerre pour en faire une ſemblable.*

3. *Quand l'empereur aura eſpouſé l'infante, il tachera d'obliger l'Allemagne à deffendre les Païs Bas, qui eſt le cercle de Bourgogne, qu'il aura à cauſe de ſa femme.*

4. *Les Suedois en veulent à Breme, & on ne croit pas, qu'ils agiront contre l'eveſque de Munſter, ny contre l'Angleterre.*

5. *On dit, que la ligue entre la maiſon d'Auſtriche & voſtre Roy eſt ſignée. Si le Portugal s'accommode avec l'Eſpagne, la choſe eſt hors de doubte.*

THE encloſed is an extract of what was further received of Dr. *Beale*'s barometrical obſervations by,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

SIR, I doubt, the good news, we had here, of the diſcovery of a northweſt paſſage, is not true, becauſe you would elſe, I am perſuaded, have done me the favour of confirming it by a word or two.

Extract of more barometrical obſervations.

I MUST obtrude upon you more barometricals, as occaſioned by the good news you give me of honourable Mr. *Boyle*'s Hydroſtaticks coming abroad. For it ſeems to me, that the barometer ought to be an appendage to hydroſtaticks; and no man ſo fit or ſo able to give an account of it, as Mr. *Boyle*, whoſe right it is. And to me, it ſeems the moſt wonderful diſcovery, that ever was in the world; I dare not except magnetiſms, if we ſpeak of ſtrangeneſs, and juſt wonder, and philoſophical importance, ſeparated from the intereſt of lucre. For who could ever expect, that we men ſhould find an art, to weigh all the air, that hangs over our heads, in all changes of it, and as it were to weigh and diſtinguiſh by weight the winds and the clouds? Or who could believe, that by palpable evidence we ſhould be able to prove, the ſereneſt air to be moſt heavy; that thick air, and when darkeſt clouds hang neareſt to us, ready to diſſolve, or dropping, then to be lighteſt. To ſend a ſervant any hour of day or night, to bring information what the weight of the air, winds, or clouds. And ſurely this belongs to hydroſtaticks: and though we cannot yet reach to all the uſes and applications of it, yet we ſhould be entertained by the inventor for a while upon the delight and wonder. The main I now can add to my former notes, is, that I have ſeldom ſeen the change to be very great at any one time. I do not now take a deliberate view of my notes, but I wondered once to ſee, that in one day it ſunk about $\frac{3}{4}$ of an inch. Of late I have altered my method, and am watching (by day, and much of the night) for the moments of every particular change, to examine what cauſe may appear of every change. And now my wonder is to ſee, how ſlow it is, and how little it does change at a time: it holds moſt between the 29th and 30th inch, of late.

MAY it belong to hydroſtaticks to enquire, whether a pound of ſugar grows heavier, when it gathers mixture in damp air? A grocer's wife would ſo perſuade us; and pretends to betray another's fraudulent frugality, whilſt ſhe kept her ſugar by the fire, and ſold the more for the money and weight. So ſalt ſeems to draw the aquatick particles of air, for encreaſe of weight; and yet conſumes and waſtes by expiration. And I cannot tell, whether ſalts (ſome more than other) may not expire, and operate through a ſealed glaſs. I have ſeen them diſſolve through diſhes, and wooden veſſels, which retain water; and water paſſes through ſome wooden veſſels, which retained mercury; and yet mercury paſſes through other ſmall poroſities, where water is arreſted. This was in my thoughts, when I read in Mr. *Boyle*'s Cold, pag. 51. that ſome liquors have peculiar textures; and ibid. pag. 59, 60, 61. of a thermometer yielding to an irregular contagion.

JANUARY 5 and 6, in the mornings, the glaſs windows were full of drops, though the weather very fair and warm. It was not ſo, ſince I wrote of it before, though ſometimes great froſts, and ſometimes rain, and much dew without, and on our marbles within. And now a ſaltſeller, which I had emptied of the ſalt, had taken a good quantity of ſalt water, which I conceive to be drawn thither by the ſpirit of ſalt, reſiding in the metal. Is no kind of liquor ſometimes heavier, than at other times, by change of weather, drought or moiſture, heat or cold?

THESE alſo, I pray you, with my humble ſervice to the truly honourable Mr. *Boyle*.

London, January 27, 1665-6.

SIR,

THE favour of your laſt of January 20, came not to me till this morning; after I had ſpoken with Mr. *Crook* about the reprinting of the Sceptical Chemiſt, concerning which I found him ſo eager, that he aſſured, he would, as ſoon as he had the promiſed additions, immediately give order for another impreſſion, adding, that if he had not been unwilling to offend you, he might have printed and ſold a ſecond edition of another 500 copies ere this, to good advantage; and therefore entreats you, that you would pleaſe, as ſoon as conveniently you can, to expedite to him, what is to be added; and engages withal, to cauſe the Latin hiſtory of Cold to be likewiſe diſpatched forthwith. I find, that *Micrography*'s Latin tranſlation is advanced to obſervation 50 excluſive; where, I ſuppoſe, it is chiefly, that omiſſions are expected; the directions whereof would now, I think, be ſeaſonable, if addreſſed to Dr. *Wilkins* (with whom the buſineſs was tranſ-

acted)

acted) without naming me for this intimation. As for the Latin of the Uſefulneſs, &c. which is with me, it begins (as I remember you directed, when it was undertaken) at the fifth Eſſay of the ſecond part, and is thence advanced to the thirteenth chapter; where it is not like to ſtick long, my purpoſe being, God granting me further health, to finiſh it with all poſſible ſpeed, now I have done what has been ſent to me of the Hydroſtaticks, which is to pag. 128, having as yet received no more of it; and when more comes, that and the ſequel of the Uſefulneſs may employ me by turns. I have this day ſent *Schottus* to M. *Hatherton*, humbly thanking you for it, and begging your pardon for keeping it ſo long; which yet I would not have preſumed to do, if it had not been for the ſad calamity we have ſo long lain under. Sir, you will much oblige me by the communication of the particulars of the earthquake you mention, (but we have heard as yet nothing of) and of thoſe relations of gigantick bones, you intimate to have received formerly. When I ſee Mr. *Hook*, I ſhall tell him what you bid me. He is now buſy about his pocket-watches (which he thinks *de Son* hath taken from him) and his new-faſhioned chariot, which our preſident, who went in it from *London* to colonel *Blount*'s houſe, finds not unexceptionable, no more than he does that of the ſaid colonel: but it is hoped, that the defects in both do admit of emendations, which, I ſuppoſe, the inventors are now employed about. We hear, the earl of St. *Albans* has brought alſo one from *Paris*, finer than any yet ſeen, of which I ſhall be glad to hear more certain and more particular news. I waited yeſterday upon our preſident to Mr. *de Son*'s houſe, who ſhewed us three of his pretended parabolar object glaſſes, but evaded the putting them into a tube for a trial, by pretending, that one of them, which he looked upon as very good (being of Venice glaſs, the other being but of ordinary Engliſh glaſs) was not yet perfectly poliſhed. My lord thinks the figure rather hyperbolical (and therefore fitter for teleſcopes) than parabolical: and this artiſt profeſſing himſelf no critick, nor ſo much as at all verſed in the terms of art, is likely enough to miſtake the one for the other, and to do better in this caſe than he ſpeaks; which error we ſhall early pardon him. Thoſe of the Society, that are now in *London*, do endeavour to get a good collection of natural and artificial curioſities for the Society's repoſitory; and they hope to make ſhortly an acqueſt of a very good ſtock of that kind, which will look as ſomething towards a foundation, and will invite generous men to increaſe it from time to time. We have thoughts of engaging as many of the Society as are cordial, and have opportunity to obſerve and bring in what is any ways conſiderable of natural productions in *England*, *Ireland*, *Scotland*, every one his ſymbol, for the bringing together a natural hiſtory of what is in the ſaid kingdom, as well as we intend to collect what is abroad, by enlarging our correſpondences every where we can. I doubt not, Sir, but you will prevail with all your ingenious friends, both in *England* and *Ireland*, to contribute to this work what is in their power.

MR. *Hook* has alſo ready (having ſhewed it me and others) a method for writing a natural hiſtory, which, I think, cuts out work enough for all naturaliſts in the world; and intends, as I hear, to print it ere long: for the mentioning of which, I deſire, I may not be named. Mean while, I wiſh moſt heartily, both yours and his were publick, conſidering the great good it would do to philoſophy, moſt men not knowing what to enquire after, and how.

Now the French king hath declared war againſt *England* (which he did, it ſeems, very briſkly, when he ſent word to the queen-mother of *England*, that he muſt do it within two days) we ſhall, I fear, meet with ſome interruption of our philoſophical commerce, as we cannot but do with a total one of merchant-trade. I have ſince preſſed an Engliſh gentleman, that intends to come over with our embaſſador (who is now arreſted by the gout) to bring over ſuch curious books, as, I have been by ſeveral letters informed, are to be found at *Paris*, as *Redi de vipera*, *Mariana de la Chine*, *Des Cartes de homine* in French, *Petit des Cometes*, &c.

THE proclamation of the war, I find, was very ſolemnly made at *Paris* by heralds; and they ſay, the ſame proclamators are to be ſent hither, to give us fair warning. We think here, this will unite *England* as one man. I am ſure, the duke of *Albemarle* bends all his thoughts and power to put things into ſuch a poſture, as the importance of this affair requires, making ſure of proviſions, ammunitions, and payments, for a whole year, and of captains, that know their work, and have courage to perform. Our merchants ſeem now reſolved, as they muſt be, to ſuſpend all traffick, and to obſerve, *hoc age*; which, if well and ſucceſsfully done, will amply compenſate that intermiſſion.

SINCE I wrote this, I had a viſit from Dr. *Poleman*, who tells me, that he has received *Comenius*'s new edition of the Drabician Prophecies, maintained by the publiſher, as truly divine: whereupon, when I ſhewed him Mr. *Spencer*'s Animadverſions, I had for anſwer, that all that, and much more, was anſwered in this edition; of which there is no more than one or two in *England* as yet. When I ſhall have ſeen any of them, you are like to hear of ſome particulars thereof from,

SIR,

your faithful humble ſervant,

H. O.

London, Feb. 24, 1665-6.

SIR,

I WAS very glad to ſee yours of Feb. 19. (which came but yeſternight to my hands) and there to find your being freed from the late

late indiſpoſition, as alſo your thoughts of coming nearer to us. Such perſons, as you, Sir, we highly need, to aſſert and promote the deſign and intereſt of the Society, and to ſuggeſt the proper ways of carrying on their work. There are ſo few of ſuch, that unleſs either they redouble their zeal, or their number encreaſe, that noble inſtitution will come far ſhort of its end. We are now undertaking ſeveral good things, as the collecting a repoſitory, the ſetting up a chemical laboratory, a mechanical operatory, an aſtronomical obſervatory, and an optick chamber; but the paucity of the undertakers is ſuch, that it muſt needs ſtick, unleſs more come in, and put their ſhoulders to the work. We know, Sir, you can and will do much to advance theſe attempts; and we hope, the heavens are reconciled to us, to free us from the infection, and to return you to *London*. Our preſident is to ſummon us to aſſemble again on the 14th of March next, if in the mean time he ſee no cauſe to the contrary. The arrears of the Society amount to above 600 *l.* How to get them paid is the queſtion. Mr. *Colwall* has lately preſented us with another 50 *l.* therewith, and with the former 50 *l.* of his liberality, to purchaſe a very handſom collection of natural things for our repoſitory, which may be ſome part of an eſtabliſhment. My lord *Brounker* will now by all means be releaſed of his preſidentſhip, and he is ſo peremptory in his reſolution, that it will be very hard to engage his lordſhip for another year. I know, Sir, they have an eye upon you for his ſucceſſor, thinking it very important to chooſe perſons into that chair, in whom birth and ability are in conjunction: and I would fain perſuade myſelf, you will neither injure them nor yourſelf ſo much, as to decline that honour, eſpecially ſince it will not oblige you to ſuch an aſſiduity, as is indiſpenſible, proviſion being ready to ſupply your place upon occaſion.

I HOPE, Mr. *Williamſon* and I have ſo ordered the matter in the point of correſpondency, that there will be no exception taken of it. I could have as eaſily engaged Mr. *Godolphin* for the ſame purpoſe, but that he is gone to *Spain* with the earl of *Sandwich*, for which kingdom they both have received as well philoſophical as political inſtructions.

I RECEIVED the ſequel of the Hydroſtatical Paradoxes but on Thurſday laſt (Feb. 22.) If the ſheets had come to me, as they were printed off at *Oxford*, the verſion would have been near ready by this time. However, if the printer will, he may preſently begin the Latin, of which more than half is done; and I promiſe him, that God vouchſafing me health, he ſhall be furniſhed weekly with matter ſufficient for two printed ſheets; only let him give me directions by whom to ſend conſtantly. I long to ſee alſo the Origin of Forms, and hope, an examplar of it will come along with the other promiſed favour of the Hydroſtaticks. Whatever enquiries you can ſpare, whether about inſects, or other parts of natural Hiſtory, all will be exceeding welcome; and the ſame I ſay of the obſervations about the Baroſcope, intending carefully to obey your orders, that reſpect M. *Hook*.

I NOW expect daily more than one friend from *Paris*, bringing along ſeveral treatiſes I have looked for this twelvemonth. Monſieur *Auzout* and others offer to continue their philoſophical commerce, though that of ſtate and merchants be interrupted; and I hope, I ſhall not be deficient in entertaining it. The ſaid *Auzout* let me lately know of two perſons of quality and good eſtates, that have ſet, with others, upon optick glaſſes; one is Signior *Burattini*, grand maſter of the Mint of *Poland*, rich, curious, and a good mechanician: the other Monſieur *de la Son*, (not *de Son*) a French gentleman, who has promiſed to be ſhortly at *Paris*, and there to produce glaſſes of his faſhion. *Burattini* is ſaid to have already made good ones of 60 foot, and with them to have ſeen in *Venus* ſome inequalities, as we ſee in the moon: beſides, to be now at work about one of 120 foot, and to have hopes to advance to 200 foot and above. He pretends alſo to make looking-glaſſes two or three times greater than thoſe of *Venice*, that is to ſay, of eight or nine foot: and he affirms to have a method perfectly to poliſh his optick glaſſes in his forms, without the interpoſition of any linen or woollen cloth, or paper, *&c.* and to give them an admirable poliſh. The other, M. *de la Son*, affirms to have found a turn, whereby he can give what figure he pleaſes to glaſſes, and ſeems to excel *Campani* at *Rome*. We ſhall ſee in time, what truth there is in theſe matters; and I look every day for ſomething alſo of this nature from M. *Huygens*, and I hope too, we ſhall not be behind in *England*.

I INTEND within a few days, to write to *Hevelius*, and to engage him to give or procure us an account of the way of making pot-aſhes, and of the ſal gemmæ mines in *Poland*. If any thing elſe come in your mind worthy to be enquired after in *Boruſſia*, *Poland*, *Liefland*, I pray ſend it me, and I ſhall diligently recommend it. Some enquiries about amber would not be amiſs for thoſe parts.

I MUST haſten to annex the civil news, that lately came to my hands. *Sweden* gives out, that in caſe the Lunenburgh forces fall into the country of *Munſter*, they will join with the biſhop. It is conceived, (and very rationally I think) that there cannot now be that confidence between *France* and *Sweden*, which has been formerly, and that upon the account of *Poland*, where *Sweden* will be very loth, that a king of the French nation, now ſo powerful, ſhould take root. The mareſchal of *Turenne* is preſſed upon the States for general, which is a point of a far reach, if it be complied with. The French king will then need no towns of ſecurity from them.

EIGHT Dutch men of war have joined with the duke of *Beaufort* at *Toulon*. We ſay, that if Sir *Jeremy Smith*, who is ſafe with his ſhips, can be but enforced with half a

ſcore frigates more, he will never decline any encounter with all the ſtrength, that is like to be made in the *Streights*. The Scots will all come away from *France*, notwithſtanding all the fair offers made to ſtay them. I can add no more, than,

SIR,

your very humble faithful ſervant,

H. OLDENBURG.

March 6, 1665-6.

SIR,

I HAVE received the two hydroſtatical books, but ſhall have no opportunity to deliver that, which is intended for the Society, till to morrow come ſevennight, when we hope to meet again in a body. Our preſident returns you his humble thanks and ſervice for the exemplar, preſented to him. Dr. *Wren* is returned, and very kindly enquired after you. He is very well ſatisfied with the civilities he has received in *France*, and commends particularly Mr. *Auzout*; and ſo, I think, will every ingenious and learned man. In the packet, he brought over with him for me, I do not find all I expected; which makes me think, my lord *Anneſley* will bring the reſt. There is nothing elſe, but monſieur *Redi delle Vipere*, in Italian, and ſhort; and monſieur *Petit Of the two Comets*, in French, pretty large, and all their *Journaux des Scavans*, from the beginning of January laſt, till now; in moſt of which I find, what is philoſophical to be taken out of our Tranſactions; the reſt being, generally, extracts and abbreviations of theological, hiſtorical, political, and ſuch like books. Monſieur *Petit*, in the annexed letter to me, preſents you his humble ſervice, and enquires particularly after your health and preſent occupation.

DR. *Wallis* promiſed the other day to give me what he knows of the earthquake, time enough for the next Tranſactions, which will not be printed till the middle of this month, the next precedent having been printed ſomewhat later in the former month, than uſually. If the addition, you are pleaſed to mention, of your own, might be here by Saturday next, it would enrich thoſe papers; and ſo would the obſervations about the baroſcope, you alſo are pleaſed to give me hopes of by the next. My letter to monſieur *Hevelius* is to be ſent away, God willing, next week; and thoſe queries about amber would, doubtleſs, obtain from him, or his acquaintance, a ſatisfactory anſwer. And what other inquiries about natural things you have ready, and ſhall think fit to communicate to me for foreign parts, I ſhall take more than ordinary care to recommend. Monſieur *Hevelius* inquires particularly after the Hiſtory of the Society, and the Latin verſions of your late books. The former is in lazy hands; the latter are fallen into troubleſom times, when ſtationers complain of the great rate of paper, and of the difficulty of getting books diſperſed abroad, when printed.

MR. *Crook* hath very much deſired, that he might not now be preſſed to print off the Latin of your *Hiſtory of Cold*, hoping, that within five or ſix weeks he ſhall get paper at an eaſier rate, than now he can procure. What to ſay to this, I know not.

THE laſt letters from *Holland* mention, that now Chriſtians, as well as Jews, write from *Conſtantinople* the confirmation of the reports concerning the motion of the Iſraelites, and the great hopes the Jews entertain of recovering their land very ſhortly. I ſhall refer you to theſe extracts of letters, as I receive them from *Amſterdam*.

Copie d'une lettre de Conſtantinople, eſcrite de monſieur Chaumont, ambaſſadeur, à ſon frere, reſident à Venice, le 18. *Dec.* 1665.

Il y a icy de grandes nouvelles touchant le roy des Juifs; on l'attend icy en bref: & on dit, que le Grand Seigneur ſe contentera de luy ceder la couronne de la Paleſtine. Et la plus part d'entre les Juifs ne font plus de negoce, mais s'appreſtent pour s'on allez à Jeruſalem. Au commencement monſieur le Gendre & moy nous nous mocquions d'eux, faiſans peu de conte de tout cecy; mais à cette heure, par les apparences qu'il y a, nous craignons que ce ne ſoit tout de bon.

Copie de la lettre d'un conſul François de Smyrne, eſcrite à un Chreſtien, ſeigneur Joſeph Roſano.

Il y a icy de nouvelles conſiderables avec l'arrivée en cette ville d'un roy des Juifs, qui eſt une perſonne de grande conſideration & de grande ſapience, de qui les Turcs meſmes ſont grand eſtat. Noſtre nation demeure avec quelque peur. Dieu veuille, qu'il ne nous cauſe quelque dommage.

De Paris, le 19. *Fevr.* 1666.

Les bruits continuent icy journellement touchant les Juifs, & qu'ils s'aſſemblent ſous un certain perſonage, qui ne ſe dit pas eſtre le Meſſiah, mais qu'il eſt divinement ſuſcité & envoyé pour raſſembler la nation Judaique de tous les bouts de la terre, à fin qu'ils apprennent à conoiſtre le Meſſiah venu, qui juſques à preſent leur a eſté inconnu. L'on dit, qu'on remarque de la divinité en luy.

I SAW a letter from *Marſeilles*, that informs us, that the French fleet intended to be out by the beginning of this month, conſiſting of but thirty two men of war, the Dutch compriſed, beſides ſix fireſhips.

SIR *Jeremy Smith* is ſeventeen men of war, two fireſhips, and a ketch.

I HAVE no more to add, than that I am,

SIR,

your very humble
and faithful ſervant,

H. OLDENBURG.

SIR,

London, March 13, 1665-6.

SIR,

A DOUBLE preſent obliges to double acknowledgments, which I humbly deſire your acceptance of, for the barometrical obſervations and advertiſements, as well as for the relation concerning the earthquake and the concomitants thereof; which will enrich my next Tranſactions, God willing; my papers for this month having been ſent away to the preſs on Saturday laſt, as ſoon as they were compleated for two ſheets, it being high time to have them diſpatched, leſt the printing of them ſhould fall out too late this month. I find obſervers, and, amongſt them, my lord *Brounker*, concur in the taking notice, that in long dry weather the mercury keeps very high; and when I mentioned ſome other particulars, contained in your letters, to his lordſhip, he preſently intimated, it would do very well to publiſh, next time, your communications, before I had taken notice to him, that for that very purpoſe I had procured that favour from you. I am now about inviting monſieur *Auzout*, Mr. *Hevelius*, and others, to join with us in making ſuch obſervations, and ſending them ſome directions and cautions for the better performance thereof; ſuch as are, the careful excluſions of all air, the employing of pretty large tubes, and leaving a good ſpace above the mercury, or providing a cane with a bolthead, that in caſe there ſhould be left any air, its ſpring may be ſo weakened by expanſion, as not to be able to produce any conſiderable effect. Where, if you have any other advertiſements to give, beſides thoſe you have been pleaſed to expreſs in your former, ſuch as the noting the hours of the day, the weather and winds, the ſituation of the place, where the barometers ſtand, they will be very acceptable to all. There occurs a paragraph in yours of March 7, which the tranſcriber has miſrepreſented, inſomuch that I cannot reach your ſenſe in it. For after you had related the difference, you find betwixt your barometers at *Oxford* and *Staunton*, you annex a certain inſtruction, which the amanuenſis ſets down in theſe words:

"WHICH obſervations may teach us, that "the ſubterraneous ſteams, which aſcend into "the air, or the *other* (this word *other* ſure "is miſtaken for *æther*) and of the varying "weight of the atmoſphere, do, many times, "and, at ſome places, uniformly enough, "affect the air, to a greater height in the air, "than, till I had this trial, I durſt conclude."

So far your note: which, I am ſure, is punctually tranſcribed, as I found it; but has certainly a miſtake (beſides that obvious one in the word, *other*) which I cannot remove, and ſeems to lye in the words, *and of the varying weight of the atmoſphere*. You will pardon me this trouble, and favour me with rectifying the error. And ſince it falls out ſo, that your relation of the earthquake cannot be printed, till next month, I ſhall beg the timely communication of that further account, you give me hopes of, in your laſt; if we ſee you not here before that time.

I SHALL ſtay one week longer, before I ſend away my letter and enquiries to Mr. *Hevelius*, hoping you will ſuggeſt ſome others, proper for thoſe parts. Mine do concern the optick glaſſes of *Burattini*, the hiſtory of potaſhes, an account of amber, ſal gem, frozen and revived ſwallows, freezing of animals to death, concentring of colours, and altering the electrical faculty of amber, and the properties of the magnet, by cold; and ſuch like, as you intimate a deſire to have enquiries made after, in your hiſtory of that quality.

I DO intend alſo to recommend ſome queries to Sir *Gervaſe Lucas*, who next week is to embark for the *Eaſt-Indies*, to be governor of *Bombaii*, and has offered his ſervice for philoſophical purpoſes; which he will, I am perſuaded, perform the more effectually, if he may receive ſome inſtructions from you.

I AM ready to furniſh the printer weekly with two or three ſheets of the Latin tranſlate of your Hydroſtaticks, if he be ready for diſpatch. And if I might be allowed an exemplar of the Origin of Forms, I would endeavour to give ſome account of it in the next Tranſactions, as I have done of the former book, in thoſe, that are now printing.

ONE of the French journals takes notice of a letter, lately written from *Amſterdam*, of a propoſition made there of a way of preſerving ſhips from being worm-eaten; conjectured to be performed by the means of a certain bitter and penetrating lixivium, reſembling that bitterneſs, which is related to be found in a kind of wild Indian pear-tree, not at all ſubject to be damnified by any worms. Methinks this ſhould excite the curious and knowing men in *England* to deviſe ſuch a preſervative of timber, as is eaſy to be made, and of ſmall charges; without which it would be of no avail. I have ſeen a preſcription of Sir *Thomas Mayerne*'s, conſiſting of ſulphur and aqua fortis; which, upon this occaſion, I ſhall look after; and, if I find it, preſent it to your view, if you have not ſeen it already.

IN another of thoſe journals an account is given of the uſe of chocolate, together with the deciſion of a pleaſant caſe of conſcience, *viz.* whether a draught of that ſubſtance breaks a faſt enjoined by the church? Which having been ventilated pro and con, is at length determined by a cardinal in the negative. Surely *Hudibras* would jeer ſomebody out of *England*, if he ſhould find ſuch caſes and deciſions in his monthly book.

GREATRIX does certainly ſome cures by his frictions, inſinuating (perhaps) ſome ſalubrious ſteams or ſpirits of his own into ſickly people's bodies. Monſieur *de Son* hath been ſtroked by him, and he tells me, that whereas he hath been for ſeveral years troubled with great back-aches (which indeed have been ſometimes ſuch, in my preſence, that he could not ſtir or turn himſelf without great pain, which ſometimes forced him to cry out)

he now finds himſelf, upon being ſtroked, very well, inſomuch that he purpoſes, in caſe of continuance, to go to ſea with prince *Rupert*, in whoſe lodgings this cure was performed; his highneſs, as the patient told me, having urged him to ſuffer that friction.

WE have not any conſiderable news from abroad, that I hear of. Sir *Chriſtopher Mings* is in the *Elve*, to prevent the deſign of Daniſh ſhips from obſtructing the return of our merchant-men from thence. The Jews ſeem to promote their enterpriſe with vigour in *Arabia* and *Paleſtina*; two or three dozen prophets, that are ſaid to be amongſt them, doing good ſervice to the pretended king, who is ſaid not to aſſume the dignity and office of the Meſſiah, but to lead to him.

I HOPE you will now haſten to viſit *London* again, eſpecially ſince, I hear, ſo good a conveniency is found out for you at *Newington*; whereof you will hear more from another hand, I ſuppoſe, by this very poſt. The election of a new preſident muſt be left to the genius of the body, that is to chooſe, whoſe members are to employ themſelves for its ſervice, every one according to their ſeveral abilities, whereof, I do not queſtion, but impartial judgment will be made by competent judges: which is all, I had to ſay, at this time, as,

SIR,

your very faithful and

humble ſervant,

H. O.

London, March 17, 1665-6.

SIR,

I MUST begin this letter with giving you the thanks of our ſociety for your late reſpect of preſenting them with one of your laſt books; of which the preſident, as having it peruſed before, gave that character to the company, it deſerves; ſeveral of them were inquiſitive after the other, concerning the origin of forms; to whom I gave anſwer, that I thought, they would ſee that alſo, ere long, in *London*.

I DID preſume to give ſome account of the hydroſtatical book in the Tranſactions of this month, come out but Thurſday laſt, chiefly *ad movendam ſalivam exteris*; to ſome of whom at *Paris* and in *Holland*, the ſaid Tranſactions will be ſent by poſt. What was inſerted in number 9, about the ways of ſounding depths and fetching up of water, I am apt to think, that if the words, employed by me, be examined, they will not be found to import a new invention, but only, a new contrivance of a way already ſtarted; ſince it is there ſaid, that "the following ways were contrived by "*M. H.*" which cannot well be otherwiſe interpreted, than that the ways, as they follow, were contrived by him; not, that he firſt invented the notion of this practice: and he affures me, that that way of ſounding with a round leaden or ſtone ball, he borrowed from no author; which makes me conclude, I ſpoke truly and candidly, when I ſaid, that that way, as it is deſcribed there, was contrived by him. I am ſure, I was, in my thoughts, as far from derogating any thing from another, as any perſon alive, whatſoever, can be; and I am perſuaded, it will appear, by all the Tranſactions, that I have been all along ſcrupulouſly careful, not only to give every one his own, but alſo to vindicate that to the owner, which others have appeared to rob him of. But if this ſhould not be thought ſatisfactory, I would beg, Sir, that the farther remonſtrating of it may be deferred till our perſonal meeting; an amanuenſis being, in my opinion, leſs proper to receive into his pen a matter, wherein a man's candor is, or but ſeems to be, called in queſtion. I doubt not, but you have received a full account of the lodging-place, deſigned for you at *Newington*. Mr. *Coxe* ſoliciting me to give him a viſit there, I walked thither on Thurſday laſt; and, though I was not within the houſe, that is to be taken up for you, yet I looked upon the places about it; and muſt needs ſay, that it ſeems to me very convenient for you; there being a large orchard, a walk for ſolitary meditation, a dry ground round about, and, in all appearance, a good air; all which Mr. *Coxe* affirms to be accompanied with a civil landlord, and fair landlady.

AT our meeting on Wedneſday laſt at *Greſham*, the preſident took ſome account, of what ſeveral of the members then preſent had been employed in, during the late ſad and long receſs. Some related what had been done by them in the matter of chariots and watches; others, what in maſonry, and the extraction of lead out of the ore; others, what in the hiſtory of the nature of ſalts; others, what in the perfecting of the experiments touching the injection into veins, and particularly about the transfuſing of blood out of one animal into another; concerning the laſt whereof, Dr. *Clerk* affirmed, that he had tried that experiment two years ago, but found it ſo difficult, that he gave it over: whereupon Sir *R. Moray* mentioned, that Mr. *Boyle* had hopes of maſtering the difficulties, that are met with in that experiment. Dr. *Wallis* being preſent, and deſired to acquaint the company, what had been chiefly done at the meeting in *Oxford* laſt ſummer, related ſame of the muſical experiments, that had been made; and being ſolicited to give them in writing, he made anſwer, that Mr. *Boyle* had recorded them. Whereupon the ſecretary was ordered to take notice of it in writing, that Mr. *Boyle* be deſired to impart the ſaid experiments, with all their circumſtances.

DR. *Beale* in his late letter preſents his moſt humble ſervice to you; and having delivered ſeveral hints and obſervations, he adds, that you uſe not to deſpiſe any of that kind; which makes me conclude, that he would have them communicated to you.

THEY are theſe:

" 1. If ſuch ſcales ſhould be deviſed, as Mr. *Boyle* acknowledges himſelf to uſe, and with this addition, that one ſcale be fitted to gather all the weight of air that may be, the other ſide to decline and avoid the preſſure of air, by this the difference of weight at one, two, or three inches in the mercurial cane, may be taken. And it is probable, that the ſhowers expected in the ſpring at hand will in few days or weeks bring down the mercury for this calculation. And (as I ſaid formerly, and do now preſs) hence by calculations we may advance, upon Mr. *Boyle*'s principles to compare the air of the whole atmoſphere (at the ſeveral great ſtages) with the weight of mercury or water, which it depreſſes, *&c.*

2. And hence alſo may be calculated, what a cylinder of air, which takes up ſo many inches, feet or yards breadth, does amount unto; and may caſt up, what the weight of air is in a cloſet, or gallery, according to the dimenſion of the room, and the ſtation of the mercury.

3. And this may be referred to the ſtatick rules of ſanity. And certainly, I have noted, that ſome men do require a far larger ſtore of air for their ſuſtenance, than others. Mr. *Mede*, the famous divine, a great ſtudent, and of a ſtomach ſomewhat greater, than is uſual in ſtudents, could not take his ſleep, nor reſt, except all the curtains and chamber windows were wide open. And this plenty of air he repaid with ſuch a ſteam conſtantly expiring out of his body, as ſtained all his clothes, and that as ſoon as he could renew them. His body always bound. And I knew a vivacious perſon, of great underſtanding, who could not ſleep, except the curtains and lodgings were open. He died lately, 102 years old. I took notice, that in that great age, or near it, he could not endure to ſleep with any cap (though but of linen) on his head. He had no baldneſs, but bred much hair.

4. Certainly my friendlieſt medicines are thoſe, which procure or aſſiſt tranſpirations; and thoſe require more freſhneſs and frankneſs of air. May not that be one cauſe of the benefit of perambulations, in oppilating diſtempers, that, beſides the motion, the air may be freſh?

5. May not a ruſh-candle, or watch-candle, be deviſed of ſuch tender flame, as may diſtinguiſh ponderous air from lighter? If by any device we could put a poſitive eſtimate upon the weight of the air in any dimenſion, I mean from the whole atmoſphere, it would much ſurpriſe and amuſe our common philoſophers, who do ſeldom conſider, that we are encompaſſed with ſuch a weight of air."

So far he: And I can go no farther, than to add, that I am,

SIR,

your faithful and humble ſervant,

Sir, ſome of your thoughts upon Dr. *Beale*'s paragraphs would be very acceptable to us both.

2

March. 24, 1665.

SIR,

BOTH your favours, the written and printed, I have received, and do now return you my humble and hearty thanks for them: the like will be heaped on you by the publick, when they ſhall ſee your barometrical obſervations and directions, together with the two treatiſes, of hydroſtaticks, and mechanical forms and qualities, both ſurpriſing and moſt uſeful books. In the former you have fully eſtabliſhed and cleared that ſubject: in the latter, you have driven out that devil of ſubſtantial forms, that, as it has hitherto done all the feats, the ſchools have been entertained with, ſo it has ſtopt the progreſs of true philoſophy, and made the beſt of ſcholars not more knowing, as to the nature of particular bodies, than the meaneſt ploughman. Since I gave notice of them in the Tranſactions, that they were coming abroad, I have been ſolicited from foreign parts, to haſten the Latin verſion of them: to comply with which, I have done my part, as to the former, being ready to ſend for the preſs half a dozen ſheets a week (the reaſon why I offer not the whole at once, being, that I would have ſome time to review) but I find no anſwer to what I ſaid in my former letters about it; as to M. *Davies* readineſs to print, if you ſhall give me order to undertake the other, *Of Forms*, &c. I am ready for that too, and ſhall diſpatch it, God vouchſafing me health, with all poſſible expedition. But I would advertiſe, that the title-pages might be forthwith printed, and immediately after ſent abroad, as *John Crook* has done, with that of the hiſtory of Cold, to which he has alſo received an anſwer from his correſponding bookſellers in *Holland*, that they will take off the whole Latin impreſſion. And this is the only way, I know, to prevent foreign tranſlations; which if *Herringman* had taken, the Latin Colours would not have lain upon his hands.

In the peruſing of the Hydroſtaticks, I met with one place, that certainly wants ſomething to make up the ſenſe; *vid.* pag. 188. in the paragraph that begins with, But let us ſuppoſe, *&c.* The defect poſed Dr. *Wallis*, when he was here, as well as myſelf, and needs a timely ſupplement, both before more of the Engliſh copies be diſperſed, and before I ſend away the Latin to be printed. There are one or two errata more, but very obvious to mend by any reader, as pag. 189. line 13. ſurfaces, for ſurface; and pag. 76. line antepenult. water in ſpecie, for water is in ſpecie.

In the reading of the *Origin of Forms*, (which my curioſity haſtened me to do yeſterday, as ſoon as I had received that preſent) I met with the following faults: in the laſt page of the publiſher to the reader, there is lin. penult. a correction, that needs another, *vid. till* pag. 169. for pag. 269. Again, pag. 64. lin. 6. *thoſe*, ſeems to be put for *though*, to anſwer the *yet*, in the next line: and pag.

325.

325. lin. 4. I gueſs, that *two inflammable*, is put for *two uninflammable*. There ſeems to be a defect alſo in pag. 369, in the latter part, beginning lin. 19. to the 2d line of pag. 370. Pag. 396. I think *ſtand* is put for *ſand:* and pag. 397. lin. 13. *it all*, for *it at all:* and in the ſame page, line 6. *& ſeq.* I do not find, that the words, *not only*, have that particle, that anſwers them. The chief of theſe may eaſily be mended by the pen, before diſtribution.

IT ſeems, that at *Florence* they have been laſt winter engaged, among other experiments, to make trials of congelation; a correſpondent of mine writing me word, that they had expoſed four veſſels, filled with common water, to the four points of the world, and found, that to the eaſt freeze firſt, that to the weſt next, and then that to the ſouth, and laſt of all, that to the north, though this laſt was frozen hardeſt of all; which I underſtand not; the particular ſituation of the place not being deſcribed, nor what fence there might be more to one part of the houſe than the other, againſt the power of the froſt. They have made, it ſeems, many others, in all ſorts of veſſels, open and cloſe, and with all ſorts of metals and glaſſes, whereof I am promiſed *le detail* hereafter.

ANOTHER friend from beyond ſeas takes notice of an obſervation made about glow-worms, that they have a red humour in them very fine and pleaſant to look upon. If I miſtake not, I have heard curious men affirm, that their ſhining quality is gone when they are dead.

MY Pariſian acquaintance endeavours the promoting of the Natural Hiſtory, telling me, upon my former ſolicitations of it, this; *Je parle par tout de beau deſſein, que vous* (meaning the Society) *avez de faire une hiſtoire naturelle, à fin de donner de l'emulation à nos meſſieurs, & les exciter à vous imiter.* I know, they will be much pleaſed, and ſet on, by thoſe comprehenſive general queries, you give me leave to enrich the next tranſactions with; and they will be much more, if they ſhall ſee thoſe particular ones (ſubordinated to ſome of the general points) which you ſo generouſly offer, and I moſt ardently deſire the communication of. Sir, you will ſee, I doubt not, great effects of theſe ſolicitations and directions, induſtry and guidance being much more wanting in this age, than abilities.

LET princes and ſtates make war, and ſhed blood; let us cultivate virtue and philoſophy, and ſtudy to do good to mankind. *Non ſileant amplius leges nec muſæ inter arma; ſed vocales ſint quàm maximè in maximo ſtrepitu bellorum.*

I AM particularly obliged to you for your favourable concern for me in my Latin tranſlations. If ever they be done and printed, I ſhall moſt greedily embrace your kindneſs. I wonder ſomewhat at Mr. *Davies*, that he ſhould make ſuch a noiſe, among our ſtationers, even by letters, concerning the Tranſactions, and the ſcarcity of their vent. Methinks, he does what he can to decry them, and has already effected ſo much, that, if they go on to be printed, I ſhall be the worſe for it by forty ſhillings a month, which is a great loſs to one, that has no other way of ſubſiſtence for ſerving the Society. And I wonder the more at him, becauſe I have not at all preſſed him to pay the reſt of what he was contracted for with, contenting myſelf (by reaſon of the troubleſom time that was, when he printed) with the nine pounds; whereas thoſe three tracts would have amounted to twenty pounds ten ſhillings. In the interim, I had a letter lately from Dr. *Beale*, who beſpeaks ſeveral copies of all the numbers hitherto printed, for ſeveral of his acquaintance in the country; and, methinks, it is probable, that thoſe, that had any of them, ſhould in time look for all the reſt; and I am ſure, I cannot get myſelf not ſo much as one copy of Numb. I. no where, having given away all thoſe I had of it, and the ſtationer alledging, he can find none of them in his warehouſe, but only ſome few ſheets of a part of it. I am apt to believe, that if Mr. *Davis* ſends thoſe copies he has left, they may in a little time be diſperſed, if the town remain in health; and then ſure his clamorous complaints may be ſatisfied. What was hoped might have brought me in about 150*l. per annum*, Engliſh and Latin together, will now ſcarce amount to 50, as the matter is like to be ordered, eſpecially ſince the ſtationers, by reaſon of the war, refuſe to print the Latin. But I am aſhamed, Sir, to trouble you with this ſtuff; that, which moſt urges me to it, is the conſideration I have, that, by the fall of this aſſiſtance, I may be diſabled to ſerve the Society.

ON Wedneſday laſt, at our meeting at *Greſham*, there was no common entertainment, about the vermination of the air, as a probable cauſe of the plague; about the rain of aſhes, that fell ſome years ago in the *Archipelago*, far off at ſea, and covered the ſhip-decks one foot deep, *&c.* ſome of thoſe aſhes being produced by M. *Evelyn*, who alſo preſented us with above forty kinds of very pretty moſſes, gathered in one wood *in Surrey*; about the retrieving of the old way to prepare and temper tools for the cutting of porphyry; about ſome experiments of gravity, made in a deep well by M. *Hook*, who produced the ſcheme of an inſtrument for finding the difference of the weight, (if any) between a body placed on the ſurface of the earth, or at a conſiderable diſtance from it, either upwards or downwards; by the advantage of which, many experiments of gravity, and magnetiſm, are like to be made before the Society. Mr. *Colwall* was publickly thanked for his new generous preſent of the collection of natural things, and a committee was appointed, for the reducing it into good order, and for the preſerving and encreaſing it.

BUT it is high time I ſhould eaſe you, and ſubſcribe myſelf, what I am really,

SIR,

your very humble,
and faithful ſervant,
H. OLDENBURG.

SIR,

London, March 27, 1666.

SIR,

YOU will find by and by, that the encloſed hath occaſioned my preſent importunity. Dr. *Beale* thinks, that in ſome of his late letters to me are contained particulars, not unfit to be prepared for your nice ſcales, whilſt you are employed in the ſtaticks, about the quantity and weight of air, that is required for the health of human bodies. Sir, I cannot doubt, but you have conſidered that matter to the bottom ere this, and therefore ſhould be unwilling to offer any thing to you about it, but only to ſatisfy the deſires of our common friend, who conceives, that the ſcales mentioned by you in Hiſtory of Cold, page 19, are eaſily applicable to the purpoſe, he urges, by a fit receiver of a preſſure of air in one ſcale, *&c.* the broader the better: or, as he hath it more fully, in another letter, if ſuch ſcales ſhould be deviſed, as you make uſe of, with this addition, that one ſcale be fitted to gather all the weight of air, that may be; and the other ſide to incline and avoid the preſſure of air; that by this the difference of weight, at one, two or three inches, may be taken. To which he adds, that it is probable, that the expected ſpring-ſhowers will, in few days or weeks, bring down the mercury for this calculation. And hence alſo, ſaith he, there may be calculated, what a cylinder of air, which takes up ſo many inches, feet, or yards breadth, does amount unto; and one may caſt up, what the weight of air is in a cloſet, or gallery, according to the dimenſions of the room, and the ſtation of the mercury. Which he would have referred to the ſtatick rules of health; he having noted, that ſome men do require a far larger ſtore of air for their ſuſtenance than others. He propoſes a ſcale for this purpoſe of extraordinary breadth, of ſome very light matter, thin whalebone, or yet lighter, to account the proportions of inequality of weight, from 27 to 30 inches.

I WISH Dr. *Beale* had digeſted his own ſenſe for you, and not commiſſionated me to cull it out of his letters here and there. However, I would not omit acquainting you with his propoſal, knowing, you will take all in good part, both from him, and,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

London, June 8, 1666.

SIR,

IF we had not expected you here every day ſince the firſt week after your departure, you would have been ere this waited upon by my ſcribbles. As we have had at *Greſham* an experiment, explicating the inflexion of a direct motion into a curve, by a ſupervening attractive principle, ſo I may preſume to gueſs, that your intentions of returning to *London* within a fortnight, were diverted by the powerful magnetiſm, that reigns at *Lees*. Thoſe load-ſtones being like to maintain their vigour, I doubt you will hardly keep your reſolution of coming to us next week, as your ſervant gave us hopes of. Mean while I ſhall mention to you ſomewhat more particularly what the experiment was, I juſt now alluded to, ſhewing, that circular motion is compounded of an endeavour by a direct motion by the targent, and of another endeavour tending to the centre. I ſay then, that for that purpoſe, there was a pendulum faſtned to the roof of the room, where we met, with a large wooden ball of lignum vitæ on the end of it: and it was found, that if the impetus of the endeavour by the tangent, at the firſt ſetting out, was ſtronger than the endeavour to the centre, there was then generated an elliptical motion, whoſe longeſt diameter was parallel to the direct endeavour of the body in the firſt point of impulſe; but if that impetus was weaker than the endeavour to the centre, there was generated ſuch an ellipſis, whoſe ſhorter diameter was parallel to the direct endeavour of the body in the firſt point of impulſe: and if they were both equal, there was made a perfect circular motion.

AFTER this there was made this other experiment. Another ſmaller pendulous body was faſtned by a ſhorter ſtring, on the lower part of the wire, which the greater ball was ſuſpended by, that it might freely make a circular or elliptical motion round about the bigger, whilſt the bigger moved circularly or elliptically about another centre. The intention whereof was, to explicate (in favour of Dr. *Wallis*'s Hypotheſis about the flux and reflux of the ſea, which has been pretty well fifted among us) the manner of the moon's motion about the earth, it evidently appearing thereby, that neither the bigger ball, which repreſented the earth, nor the leſs, which repreſented the moon, were moved in ſo perfect a circle or ellipſis, as otherwiſe they would have moved, if either of them had been ſuſpended and moved ſingly; but that a certain point, which ſeemed to be the centre of graviry of thoſe two bodies, howſoever poſited (conſidered as one) ſeemed to be regularly moved in ſuch a circle or ellipſis; the two balls having other peculiar motions in ſmall epicycles about the ſaid point.

THIS latter experiment I imparted to Dr. *Wallis*, who is, as I found by his anſwer, very well pleaſed with it; and hopes withall, that that theory of his will anſwer all the main phænomena of the tides; though he pretends not, to give thereby a ſatisfactory account of the particular varieties of them in ſeveral places of the world, for want of a full hiſtory of the ſame.

SIR *Th. de Vaux*, at the ſame meeting, preſented the company with a bundle of conſiderable papers touching coloration, drawn up by a very famous and curious phyſician, from the mouth of the moſt knowing and expe-

rienced dyers of *England* and *Holland* in his time; the Society ordered thereupon a committee, to conſider of theſe papers, and to diſtribute them among themſelves to be Engliſhed, they being almoſt all in French, and then to digeſt them: which being done, I am perſuaded, that many notable particulars will be there met with, to illuſtrate the philoſophy of dying, *&c.*

THERE was alſo, at the ſame time, brought in a diſcourſe by Sir *Gilbert Talbot*, of a rare ſtone, to be found in *Sweden*, yielding four different ſubſtances, *viz.* ſulphur, vitriol, alum, and minium: of which the preſenter was deſired to procure us a good quantity for trial, which he promiſed to do.

MONSIEUR *Auzout* was then elected into the Society, *nemine contradicente*; and a diploma is to be diſpatched to him, as was done to Mr. *Hevelius*. The ſame, I find by my laſt from *Paris*, is nominated for one of thoſe choice perſons, that are to conſtitute their academy; ſome of the reſt, that are pitched upon, being M. *Roberval*, M. *Carchavy*, M. *Frenicle*, M. *Picard*, M. *Huygens*, all very able men, appointed to meet and to conſider of the beſt way of framing a philoſophical Society, and the beſt method of carrying on its deſign. I perceive, they will chiefly purſue mechanical and chemical experiments, they having already in their eye a couple of good chemiſts, and ſome able mechanicks, that ſhall work by their directions. *On ſera faire* (ſaith my author) *tout ce qu'il faudra pour travailler utilement. On à deſia commencé de s'aſſembler pour faire quelques reglemens. C'eſt un beau et grand deſſein, qui ne peut eſtre qu'utile et glorieux à la France.* He adds, *on pourroit faire auſſi quelque choſe en Denmark, parce qu'il s'y trouve des ſujets capables et tres intelligens.* Indeed they have ſome there, that are very learned men, as *Eraſmus Bartholin* the mathematician, *Thom. Bartholin* the phyſician, and *Steno* the anatomiſt; the laſt of which has been, I find, much courted in *France*, and is now ſo in *Italy* at *Florence*. I hope our Society will in time ferment all *Europe* at leaſt: I wiſh only, we had a little more zeal, and a great deal more aſſiſtance, to do our work thoroughly, as I am apt to believe the French will ſtudy to do theirs (they being like to be endowed) were it but out of emulation. So good be done to our generation, and a ground laid to do the like to poſterity, no great matter what paſſions do concur for the performance.

THE Venetian embaſſador *Juſtiniani*, now at *Paris*, hath ſent me, by the hands of my correſpondent there, a conſiderable printed paper, (for the Society) publiſhed in *Italy* by Signior *Caſſini*, containing many notable obſervations, made in February, March and April laſt, with ſome of *Campani*'s glaſſes, touching the converſion of *Mars* about his axis, performed (as he affirms to be aſſured of by very good obſervations) in the ſpace of twenty four hours, forty minutes. You remember, Sir, that the ſame was obſerved here in *England* in the ſame months, witneſs one of our Tranſactions, num. 11. which I am now very glad took timely notice of it in publick.

DR. *Beale* preſents you his hearty ſervice: is very buſy upon ſome new ſubject; commends *Parker*'s Cenſure of the Platonick Philoſophy, and thinks, that the ſame arms againſt *Glanvil*'s Pre-exiſtence of ſouls. Mr. *Glanvil* is, I find, of an excellent temper for argument; and, I believe, that he will rather yield and fly the field, than handle a weapon unhandſomly.

I PRESUME to ſwell this letter with this month's Tranſactions. If *Eſſex* breeds curioſity, thoſe papers may be made known there by your influence; and the chief place of the concourſe of the gentry there being intimated to the printers of them, they may monthly ſend them thither, as they do to many other parts of *England*.

I NEED not, I ſuppoſe, entertain you with the relation of the late rude, and obſtinate fight, or the ſucceſs thereof. I ſhall only ſay this of it, that as the engagement will not eaſily be paralleled, ſo we ſhall find the ſucceſs, all things conſidered, a great deliverance and a dear victory to us. Mean while, God be thanked, both our generals are well, having done prodigious things, and the king in a condition to ſet out very ſpeedily another fleet; which that it may be done ſo, as to prevent our enemies, is of the higheſt concernment in this buſineſs.

WE know not where the French fleet is: ſome ſay, turned back to *Cadiz*; others in their way to come about the north of *Scotland*, to join the Dutch, and to make them appear again preſently. My laſt letter from *Paris* hath only this; *Les Suedois pourront bien eſtre mediateurs et arbitres de la paix. La France obligera la Hollande de leur donner ſatiſfaction, et de renoncer au traitté d'Elbing.*

BUT I am tired, it being paſt midnight; and I believe, you have cauſe to be ſo much more at the rhapſody of,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, Sept. 10, 1666.

SIR,

I WAS very ſorry I was abſent, when, as I heard, you did me the favour of calling at my lodging before you went out of town. If I had known the leaſt word of your intention of retiring to *Oxford*, I ſhould have made a ſhift to have waited on you at *Chelſea* before. However, I am very glad you are ſo well, as to travel: Almighty God keep and ſtrengthen you in it. I cannot omit acquainting you, that never a calamity, and ſuch an one, was ſo well born, as this is. It is incredible, how little the ſufferers, though great ones, do complain of their loſſes. I was yeſterday in many meetings of the principal citizens, whoſe houſes

are laid in aſhes, who inſtead of complaining, diſcourſed almoſt of nothing, but of a ſurvey of *London*, and a deſign for rebuilding, and that in ſuch a manner (with bricks, and large ſtreets, leaving great intervals and partitions in ſeveral places) that for the future they may not be ſo eaſily ſubject to the like deſtruction. I hope, that ſome of our Society will ſignalize themſelves in this ſurvey and deſign, which, when done to the ſatisfaction of the king, may by his majeſty be offered and recommended to the parliament. I was this very morning with our preſident, and ſuggeſted this buſineſs to his lordſhip, who liked it ſo well, that he intends to move it to morrow at the council of the Society, which is ſummoned to meet at *Greſham* in ſome other room, than formerly our ordinary meeting places, both for the council and the Society, being, as I hear, taken up by the lord mayor and the court of aldermen, as is the quadrangle for the meeting of the merchants, *pro tempore*.

I DOUBT, I ſhall find it very difficult to continue the printing of the Tranſactions, *Martyn* and *Alleſtry* being undone with the reſt of the ſtationers at *Paul*'s church-yard, and all their books burnt they had carried for ſafety into St. *Faith*'s church, as they call it; beſides, that the city lying deſolate now, it will be very hard to vend them at the preſent. I had hopes to have once waited on you to dinner to Sir *William Morrice*'s, there to have opened to him my deſires of thinking on me, in caſe the Latin ſecretary's place ſhould fall vacant, eſpecially now there is ſmaller hopes than ever, of benefactors to the Society, and the Tranſactions like to be interrupted, but charges to encreaſe; I having been neceſſitated within this ten days to pay twenty four ſhillings to the publick, for chimnies, taxes, and watching; which if it hold long, will force me to run away. Sir, if you would not think it a trouble, to ſolicit, by a line or two of your own hand, my lord *Brounker* and Sir *R. Moray* to recommend me for the ſaid employment, you would exceedingly oblige me: for though I think they both have an affection for me, yet I am aſſured, their care for me in this particular would be redoubled upon the recommendation. I leave all to your own diſcretion, who am,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

London, Sept. 18, 1666.

SIR,

YOUR very obliging letter I received, and delivered the annexed to my lord *Brounker*, who preſents his affectionate ſervice to you, and deſires you will pleaſe to ſend the mentioned experiment to me, and reſt perſuaded, he will do what is in his power for the perſon recommended. And I believe verily, his lordſhip will not come ſhort of his word; and which is more, I am perſuaded, if he had known my condition ſooner, that is ſo very low, as indeed it is, whatever face I have put upon it, he would have ſooner taken care for me. For he was pleaſed to ſay as much to me, when upon this occaſion I related to him, that my dear wife had brought me 400 *l.* whereof, upon our agreement of marriage, ſhe called in 200, laying out 100 upon furniſhing our houſe, and the other 100, partly upon the fine for the houſe, partly for other neceſſary occaſions, as far as it would go. And before ſhe died, left me the other 200 *l.* then in the hands of Sir *Brocket Spencer* and Sir *John Cotton*, from whom I received them (being neceſſitated to call them in alſo) and ſpent them partly for her funeral and payment of debts, and partly upon my ſubſiſtence hitherto; that, which the Tranſactions have yielded, being conſumed in my houſe-rent, and taxes, and duties, thoſe ſums not amounting alſo by far to what was at firſt imagined, and being now like to fall lower yet. Having been forced to repreſent this to his lordſhip, and added, that I had declined ſeveral offers of conducting young noblemen abroad, which would at leaſt have been worth to me 100 *l. per ann.* if not alſo ſome annuity *ad vitam*, after the employment ended; his lordſhip told me plainly, that if he had known ſo much betimes, I ſhould not have ſuffered ſo much, expreſſing particularly what advantageous employment in the navy (but now provided for) he could have conferred on me, which he believed I would have performed to more ſatisfaction than he, that is now in it; but yet he would be mindful of me, and not ſuffer me to want. The ſtationers of *Paul*'s inſiſt, to give them the Tranſactions for a while, till they can ſomewhat recover their loſs, which indeed is very great, all their books, carried by them into St. *Faith*'s church under *Paul*'s, being burnt, and amongſt them the hitherto printed Tranſactions. I tell them, that I ſhould not want generoſity to do ſo, if I had ability to bear that retrenchment: mean while, I have given them the Tranſactions of this month freely, if that will do them any kindneſs, or at leaſt be any encouragement to them to continue; which they ſay it will, and make them ſtretch as far as they can thereafter. In this confuſion and general unſettlement I know not where to faſten it, or to meet with any tolerable conditions for it: that made me venture the continuation with them, leaving the iſſue to providence; which, I hope, will, upon our deep humiliation before it, and a true remorſe of our impieties, raiſe this deſolated city into a far better condition than ever. Dr. *Wren* has, ſince my laſt, drawn a model for a new city, and preſented it to the king, who produced it himſelf before his council, and manifeſted much approbation of it. I was yeſterday morning with the doctor, and ſaw the model; which, methinks, does ſo well provide for ſecurity, conveniency, and beauty, that I can ſee nothing

thing wanting as to thoſe three main articles; but whether it has conſulted with the populouſneſs of a great city, and whether reaſon of ſtate would have that conſulted with, is a query to me. I then told the doctor, that if I had had an opportunity to ſpeak with him ſooner, I ſhould have ſuggeſted to him, that ſuch a model, contrived by him, and received and approved by the Royal Society, or a committee thereof, before it had come to the view of his majeſty, would have given the Society a name, and made it popular, and availed not a little to ſilence thoſe, who aſk continually, what have they done? He anſwered, that he had been ſo preſſed to haſten it, before other deſigns came in, that he could not poſſibly conſult the Society about it. However, ſince it is done without taking in the Society, it muſt ſuffice, that it is a member thereof, that hath done it, and, by what I ſee, hath done it ſo, that other models will not equal it; and I hope, that when it comes to be preſented to the parliament, as the author will be named, ſo his relation to the Society will not be omitted.

THE parliament was adjourned from this day to Friday next; his majeſty ſending them word, that he deſired to meet them in a fuller houſe. It is conjectured, that ſome news is expected ſhortly from the fleet, whence a meaſure is to be taken of a part, at leaſt, of the ſpeech intended for the parliament. The French fleet hath at laſt appeared about the iſle of *Wight*. I conceive, that another engagement between us and the Dutch being expected, they would draw nigh, to be in readineſs to come in, as a reſerve in the midſt of the combat, and to try their fortune upon a tired, and at leaſt ſomewhat diſabled fleet. But the ſtorm, that has been very violent this night, and continues ſtill, though not ſo fierce, is like to have diſappointed all the three fleets (if they have not fought before it) and damnified them exceedingly.

SIR, I intended to have given you an account of what counſel was given on Sunday laſt to the king, in a ſermon; as alſo of ſome particulars ſent me from *Paris*; but that I have been tedious enough already, and muſt alſo ſpare my eyes; who am,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, Sept. 21, 1665.

SIR,

I HAVE good hopes, the generous inclinations of thoſe two worthy perſons, the lord *Brounker* and Sir *R. Moray*, thus excited by the ready favour of your recommendation, will prove effectual for my relief. I am ſure, I am eternally obliged to you for your ſo careful a concern for me. Your commands to me for my lord *Brounker* I hope I ſhall have occaſion to obey to morrow, when we meet at *Greſham*; which perhaps will be the laſt meeting in that place, the city ſtriving hard to get that college totally into their hands for this time of diſtreſs: which if they obtain, the Society are provided with another place to meet in, to wit, in *Arundel* houſe, by the generoſity of Mr. *Howard*. I doubt not, but they will be very well pleaſed with the account of the way of transfuſing blood out of one dog into another; and accordingly order me to return their thanks. I believe Mr. *Martyn* has ſent ſome copies of this month's Tranſactions, printed with ſome difficulty, for *Oxford*; which makes me forbear to charge this letter with an exemplar. If you thought fit, Sir, to gratify the publick and me with your excellent queries of mines and petrifying waters, for the approaching month of *October*, in which my Hungarian friend intends to depart hence for his country, it would be a very ſeaſonable favour; and the notification of your thoughts concerning it by the firſt conveniency would be a great addition to it.

THE French news I would have written laſt week, are, that at *Paris* they apprehend a peace between *Spain* and *Portugal*; and that they hear, a league is concluded between *England* and the houſe of *Auſtria*; which they ſay muſt needs be followed by a conqueſt of *Flanders*, and, they hope, of all the *Low Countries*.

MY philoſophical friend tells me, that another volume of *Des Cartes*'s letters is printed, promiſing to ſend me a copy by the firſt opportunity.

I KNOW not, Sir, whether you heard any thing of the advice given to his majeſty on Sunday was ſev'night, in a ſermon preached before him by Mr. *Frampton*, lately returned from *Aleppo*. It contained theſe particulars; that his majeſty, for the bringing of virtue and piety into faſhion, would pleaſe to put in execution all his laws againſt impiety and vice; invite ſeriouſly his whole court, the nobility and gentry, to countenance virtue and diſcountenance vice; deny his favour to all libertines and profane perſons; and remove out of his own breaſt, if any thing ſhould lodge there, capable to provoke God's diſpleaſure. All which being done, he aſſured himſelf, that it would not only caſt ſuch a light and ſplendor about his majeſty's throne, as to ſcatter all the works of darkneſs, but alſo bring ſuch a flood of bleſſings upon him and the whole kingdom, that *England* would be the wonder of the world for proſperity.

THE parliament hath voted in general a ſupply proportionable to the king's preſent occaſions. They are to review the account of the expences for the war; and to ſtate, for the rebuilding of *London*, that grand query, how much ſuch a quantity of ground, in ſuch a place, is worth to build upon?

THE Dutch, hearing we were all on fire in *London*, reſolved immediately to come out again, and are now in *Margate* road. Our fleet, upon the hearing thereof, will quickly come to them with this wind, and

then

then there may be another fight, if they ſtand it. It is ſomewhat happy, that our fleet of ſome thirty merchantmen, lately come from *Livorno* and *Scanderoon*, gone into *Portſmouth*, are there ſtill (as we hear they are:) for if they had been at ſea at this time, and in their way for *London*, they would hardly have eſcaped falling into the Dutch fleet.

I CAN hear nothing of my lord *Brereton*: if I meet Mr. *Haak* to morrow at *Greſham*, I ſhall enquire after the letter you mention; who am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

I SUPPOSE Dr. *Lower* will give me leave, to make his way of bleeding one dog into another publick, to invite others to the like experiments.

London, Oct. 2, 1666.

SIR,

YOUR laſt, without date, came to my hands this morning. The mention therein made of the extraordinary weight of the atmoſphere at ſuch a morning, and on ſuch a day, makes me take notice of the omiſſion of the date, becauſe it relates to the time of the writing of the letter, which is not expreſſed.

SIR, I ſhall very carefully intimate, what you ſuggeſt concerning the queries of mines, if you pleaſe to communicate them to the publick; which if you ſhall give your conſent to, will be more largely obliging and more generally beneficial, than if given only in writing to this or that perſon. I heartily thank you for the hopes, you are pleaſed to give me of other queries, or papers, in lieu of thoſe of petrifying ſprings; begging withal your pardon for my importunities. I met this morning our good friend Mr. *Dan. Coxe* at Sir *R. Moray*'s, and perceived by him, that he is very anxious at your being abſent from *London*, at a time, when there is an important cauſe to wiſh you here preſent; which yet he did not declare to me, but thus in general.

MY laſt from *Paris* contained an encloſed, from M. *de la Quintinie*, the gentleman gardiner, who preſents his humble ſervice to you, among ſeveral others, and ſhews his conſtant addiction to the improvement of gardening; wherein I find he has attained that excellency of ſkill, that he is courted by all the grandees in *France* for it.

MY lord of *Eſſex* hath found the experience of his knowledge of that kind; who being lately returned from *Paris*, was pleaſed to charge himſelf, for my uſe, with a couple of new *French* books; whereof one is of Mr. *Paſcal*, entitled, *Traité de trianglé arithmetique, avec quelque autres petits traitéz ſur la meſme matiere*; the other, *Une Relation du Voyage de l'Eveſque de Beryte par la Turquie, Perſe, les Indes, &c. juſques au royaume de Siam, & autres lieux.* I had only leiſure, ſince I received them, to ſkim over the latter; which has much more of the miſſionary in it, than of the philoſopher. That, which pleaſes me beſt in him, is, the deſcription of the beſt way of traveling into the *Eaſt-Indies* by land, and in what ſeaſon, and in what length of time it may be performed. He notes ſomething of the finding of diamonds in thoſe parts, which I know not well what to make of. It may be, Sir, you will not be diſpleaſed to ſee it; wherefore I ſhall here tranſcribe him verbatim:

Pour trouver les diamans, on prend de la terre, que l'on croit propre à les former (I ſuppoſe he means the earth, that is found in diamond mines) *qui eſt rougeaſtre, entrecoupée de veins blanches & remplies de cailloux, & de mettes dures. On diſpoſe proche des endroits, que l'on veut foüiller, une terre, qui ſoit unie & egalle: On y porte celles, que l'on a tirees de la mine; on l'eſtend doucement, & on la laiſſe exposée au ſoleil durant deux jours* (this, methinks, is a very ſhort time) *lors qu'elle eſt aſſez deſſeichée, on la bat pour la reduire en poudre, & criblant cette terre ils trouvent les diamans, & reconnoiſſent les cailloux, où la nature les a enchaſſez.* Thus he. I underſtand not, whether theſe expoſed earths in ſuch places, that are ſuſpected to have diamond mines, being found afterwards to have little diamonds generated in them, ſhall ſerve for a ſign of ſuch mines, or not?

OUR news from ſea is none other, than that our fleet is well, and has ſuffered none, but very ſlight, damage in the late ſtorms; which yet have been very unfortunate to us, upon this account, that they have hindered us twice to give the enemy battle, when we had him at very great advantage, and might, in all probability, have obtained a very important victory over him, and thereby neceſſitated him to a peace. Both the enemies fleets, French and Dutch, have ſuſtained ſome loſs by the winds; whereof I expect the particulars by the next.

THE rebuilding of the city, as to the model, is ſtill very perplexed; there appearing three parties in the Houſe of Commons about it. Some are for a quite new model, according to Dr. *Wren*'s draught; ſome for the old, yet to build with bricks; others for a middle way, by building a key, and enlarging ſome ſtreets, but keeping the old foundations and vaults. I hear, this very day, there is a meeting of ſome of his majeſty's council and others of the nobility with the leading men of the city, to confer about this great work, and to try, whether they can bring it to ſome iſſue, before the people, that inhabited *London*, do ſcatter into other parts.

THE great ſtreſs will be, how to raiſe money for carrying on the war, and to rebuild the city, at the ſame time.

SIR, I muſt not omit to tell you, that my Pariſian friend acquaints me, there is one, that has anſwered Mr. *Hobbes*'s book *de cive*, but the anſwer not yet printed. He adds;

Ce luy, qui y a travaillé, a de l'eſprit, & a bien reuſſy.

THEY are troubled at *Paris* at the death of Mr. *Manſart*, their beſt architect, who vied with the chevalier *Bernini*.

ONE monſieur *Varin* hath lately made *le buſte du roy* in marble; which they eſteem no leſs than that of the ſaid *Bernini*.

SIR, if you favour us with the abovementioned queries, and they come to my hands next Monday, they will come ſeaſonably for the Tranſactions of this month to,

SIR,

your faithful humble ſervant,

H. O.

London, Oct. 16, 1666.

SIR,

THOUGH I muſt confeſs, I reckoned upon the queries touching the mines for the Tranſactions of this month, and that the more, becauſe of my *Hungarian*'s readineſs to return into his country, as alſo (which came but lately to my knowledge) of Mr. *Thynn*'s, who is of the Royal Society, intended voyage for *Sweden*, whither he is to go within this week, as envoy from the king; yet, ſince the communication thereof is but deferred till next month, I am ſtill to give you my humble thanks for continuing your favour and intentions of imparting them to the publick by my hand: which acknowledgments I am to redouble for the heads, you have been pleaſed to ſend me, concerning ſea-waters; in the publiſhing whereof I ſhall endeavour to obſerve your directions. My firſt to Dr. *Beale* will, if God permit, give him notice of what you propoſe about trials and obſervations for the diſcovery of the nature of petrification, if there be any petrifying ſprings in his neighbourhood.

THE two laſt Wedneſdays, having been days of humiliation, we have had no meetings at *Greſham* college. And the ſtationers and printers having ſuſtained great loſſes in the late fire, and not knowing, as yet, how to ſettle and to reaſſume their trade, ſo as to make gain thereby; do very much ſcruple to print any thing, except it concern the preſent affairs of the war, and of the city: in regard whereof, it will be very difficult to perſuade them to continue the printing of the Tranſactions, unleſs I let them be printed without conſideration for the charges and pains, I am at in the digeſting of them; as I did the laſt: which my condition will not bear, however my ſoul be free enough to conſent to it, if I could.

THE vote for the raiſing of 1800000 *l.* you cannot but know; as alſo, that a committee is appointed, to conſider of the beſt way of raiſing it; which, it is thought by many, will be by continuing the tax upon real and perſonal eſtates.

THE other grand affair, about rebuilding the city, is not neglected neither; ſtrict injunction being now iſſued by the lord mayor, in the king's name, to clear the foundations of all burnt houſes of the rubbiſh, within a fortnight, which done, the ſurvey and admeaſurement of all ſuch foundations is to be forthwith taken in hand, and that by the care and management of Dr. *Wren* and Mr. *Hooke*: which ſurvey is to be exactly regiſtered, for the better ſtating hereafter every one's right and propreity. And then the method of building will be taken into nearer conſideration, and, it is hoped, within a ſhort time reſolved upon. All which may be more fully ſeen in the printed paper, for that purpoſe made publick by the lord mayor.

FROM *Holland* we have received the printed ſentence of death, pronounced (and ſince executed) by the States General againſt monſieur *Buat*; the ſum whereof is: That he having maintained, beſides a known and allowed correſpondence, another ſecret and forbidden one, with certain miniſters of *England*, and thereby made the world believe, that the States General might make peace with *England*, when they would, if they would but ſend perſons thither to treat, and that many of the ſaid ſtates were of the ſame opinion with him: beſides, having entertained motions from *England* for ſeparating from *France*, and for ſending commiſſioners thither, without the French, as alſo, having conferred with an Engliſh envoy at *Antwerp*, and there contrived a model of a letter, to be written by the king of *England* to the States, to perſuade them to diſpatch ſome perſon to him: which being done, he and his complices in the government would employ themſelves vigorouſly to preſs, in the States aſſembly, that the king's deſire might be complied with. Of which conference in *Antwerp*, a report being made to the king of *England*, his majeſty, though he thought not fit in that conjuncture to write ſuch a letter, yet did very much approve of the deſign of procuring an embaſſy to him: which particulars being written from *England* to *Buat*, he, by a miſtake, delivered that letter, among others, to *De Witt*, and thereby diſcovered his double correſpondency, whereof the unallowed one tended ſo much, as they conceive, to the traducing of their government, and the cauſing of diſturbance and diviſion among their people. That therefore the ſovereign court of *Holland*, *Zealand*, and *Frieſland* did condemn the ſaid *Buat* to have his head cut off, and his goods confiſcated.

FROM *Paris* the letters mention the reſolution there taken by the king, *de pouſſer la guerre vigoureuſement, pour reduire les Anglois à la raiſon.* They ſpeak likewiſe of a deſign, that the king hath of reforming *Paris*, by freeing it from dirt, rogues, and the tricks of the law: this I ſhall give you in my friend's own words: *Il y a un conſeil de police, qui conſiſte de* 8 *conſeillers d'eſtat, nommez pour avoir ſoin de la police de Paris, qu'on a diviſé en autant de quartiers. Si on pouvoit nous delivrer de bouës, de filous, & de la chicane, Paris ſeroit*

une demeure admirable, & il n'y en auroit point au monde de ſemblable. (There muſt be a river of *Thames* too, to make good ſuch an encomium.) *Outre cela, on pretend mettre un prix fixe au pain, à la viande, au bois, & à toutes autres ſortes de denrees. On pourſuit desja les filles de joye* (this is like to make them *filles triſtes*) *qu'on veut exterminer, parce que leur logis ſervent de retraites aux filoux. Si vous avez quelque bon avis à nous donner, vous nous obligerez, & ſervirez le public.*

I AM hereupon enquiring, what good order there is in *London*, worth imitation, and I mean to addreſs my friend to the regulations of *Rome*, as to the ſet prizes of victuals; though there be ſet prizes alſo of ſuch houſes, as they intend to rout at *Paris*.

FROM *Italy* I underſtand, that the pope is in a departing condition, and that there is already great bandying for the next election, which will hardly be made without much diſorder and diſſatisfaction.

FROM *Spain* comes news, that the peace between that kingdom and *Portugal* is not deſpaired of; the Engliſh miniſters there employing themſelves vigorouſly for the procurement thereof.

SIR, I ſuppoſe your eyes are tired; and mine being ſo too, I ſhall ſay no more, than that I am,

SIR,

your faithful humble ſervant,

H. O.

London, Oct. 23, 1666.

SIR,

I MUST wait for your conveniency of ſending the queries for mines; and in the mean time give you my humble thanks for the favour of your concern in the Tranſactions. To this very hour I have got none yet to print them; and unleſs Mr. *Crook* (whom I do what I can to encourage to it, by promiſing him, that I will endeavour the beſt I can to procure for him the printing ſome good vendible books, as occaſion ſhall ſerve) undertake it, I deſpair of the continuation: however they write to me from *Paris*, that they are very glad to find our Tranſactions go on, notwithſtanding the ſpoil made by the late fire, (which they take occaſion to ſay, upon the ſight of number 17, which was printed after the fire, gratis.)

I SHALL take occaſion to enquire after that hiſtory of *Africa*, you mention. We hear, ſome French gentleman or other is to come over, to condole with the king for the loſs of *London*, and to preſent him with ſome pipes of claret. I hope, to procure *Des Cartes*'s new volume of letters, and *Honoratus Fabri*, and *Voſſius de Nilo*, &c. to be ſent over by that opportunity.

I BELIEVE, Sir, you have ſeen, or will ſee by this poſt, his majeſty's printed declaration of war (which is a very reſolute one) againſt the king of *Denmark*, as his greateſt enemy. The truth is, that king (as is made out by the printed book) has ſo palpably prevaricated, and ſo manifeſtly broken his faith with our king, and acted againſt all honour, even ſo far, as to act double with the Dutch themſelves, that he will be the moſt contemptible prince in the world, and never be able to waſh out a ſtain of ſo deep a dye. The Dutch themſelves, though now they muſt make uſe of him, and his own people will deſpiſe him, let him varniſh it over, as he pleaſeth; the whole charge being grounded upon plain matter of fact, proved by writings, drawn by the privity of the miniſters of three kingdoms, *England*, *Denmark* and *Sweden*. His majeſty could not avoid the remonſtrating hereof, unleſs himſelf would have been contented to lie under the aſperſions of being a violator of the laws of nations; to remove which, he has proved, that the king of *Denmark* invited him, of his own accord, to that hoſtility againſt the Dutch, at *Bergen*, which he is by him reproached of, &c.

THIS war againſt *Denmark* being like to prove implacable, we muſt caſt about, how to get the Daniſh commodities another way; which may be done by Swediſh and Hanſe-town veſſels.

FROM *Paris* they write, that they hope, there will ſhortly be a peace between them and *England:* which, I confeſs, I underſtand not, how it ſhould be effected, as affairs ſtand; unleſs it be, that our ſolicitations in *Spain* of concluding a truce with *Portugal*, in order to make us enter into a ſtrict league with both, ſhould frighten the French king into a timely peace with us, to prevent that confederation.

THE words of the letter, becauſe of their weight, I will give you themſelves: *Si j'oſois eſcrire de nouvelles, je vous en manderois de tres bonnes; & que vous apprendrez d'ailleurs, pourvû qu'on vous en diſe toutes les circonſtances. Je veux croire, que la paix ſe fera dans peu de temps.* This, I ſay again, I underſtand not.

CONCERNING the Swedes, another French correſpondent writes thus, from *Paris: Tous les princes de l'empire haïſſent mortellement les Suedois, qui ne ſont plus ſi redoutables, qu'ils ont eſté. Leurs vieux ſoldats ſont morts, & ils peu de bons officiers; l'argent leur marque, & ils n'en peuvent avoir de nulle part. La France a intereſt, qu'ils ſoyent un peu bas, parceque dans la proſperité ils ſont trop fiers. Cependant la ville de Breme court riſque: il faudra, qu'elle renonce au droit, qu'elle avoit d'aſſiſter aux dietes de l'empire; les Suedois ſouſtenans qu'elle n'eſt pas immediate.*

OUR parliament has not yet concluded any thing about the way of raiſing the 1800000 *l.* nor is the model as yet agreed upon, by which the city is to be rebuilded.

THOUGH the Society meets, yet they can do but little in this confuſion of things. The new Pariſian Academy goes on, but will conſiſt only of a few, intending to ſet upon mechanicks, chemiſtry, and anatomy, and chuſing perſons fit for the ordering and executing of things neceſſary to improve thoſe parts.

DR. *Beale* writes me word, that he hath received a ſummons for *London*, which he muſt obey, and therefore intends to come up as ſoon as his horſes, gone into Herefordſhire, do return. He confirms, by new atteſtations, what he formerly wrote of the trees taken up in the moors near *Bridgwater*; of which many were found within a foot or two of the ſurface of the ground; no branches to be found, only the main bodies, and they as black as ebony.

HE tells me, that they have no petrifying ſprings in his neighbourhood; but that they have excellent ſprings there, for terſive and ſalubrious waters; and one, called *Ruſty-well*, giving ſtones a tincture of ruſty iron. And here he adds, that they want Mr. *Boyle*'s directions for trials of waters: of which kind, if you pleaſe to ſend any, they ſhall be faithfully recommended to him by,

SIR,

your faithful humble ſervant,

H. O.

London, Nov. 15, 1666.

SIR,

I AM ſure, that on the Monday of that week, in which your laſt mentions, that M. *Davis* expected down ſome copies of October's Tranſactions, there were ſent two or three pacquets, containing ſome dozens of them, to *Oxford*; but, I believe, to other ſtationers, than M. *Davis*. I muſt not ſwell theſe letters with printed papers of that nature, though I preſume to offer them to your view, when you are near at hand.

THAT, which occaſioned my ſilence to the new magnet, when I wrote laſt, was, that your taking no notice at all of it in your anſwer, begot in me a ſuſpicion of your thinking it time enough to have an account of it at your return to *London*. But, though I hope, you will not now defer that long, yet ſince you are pleaſed to expect an explication of what I then touched, I ſhall give it you briefly, having firſt precautioned you, that it comes from a perſon, though much addicted to magneticks, yet eſteemed not very knowing or diſcerning in them: it is Sir *W. Pers*: he ſaith, "That there is a rock of loadſtones "in the iſle of *Angleſey*, hanging over the "ſea, of a greeniſh colour, which he went "lately to ſee, and, breaking off ſome ſtones, "found, they were perfect magnets, becauſe "they would nimbly excite a verſorium. But "as to their attraction, they would hardly "take up a needle, though every ſtone was "full as big as a man's hand; though poſſi-"bly towards the middle the attraction may "prove more vigorous, the virtue of the out-"ward parts, becauſe expoſed to the cold "air and winds, being, perhaps, much im-"paired. I took an obſervation (ſo he goes "on) which gave me great ſatisfaction, in "order to confute *Des Cartes*'s opinion (which "imports, that the heat of the torrid zone, "draws the *particulæ ſtriatæ* from the north, "which paſſing, by a kind of tranation, "through the bodies of magnets, gives them "the influence of their conſtant poſition to "north and ſouth;) for I made trial by the "help of a verſorium, and going about ſe-"veral parts, I found ſome out-parts of the "rock, wherein the weather and tempeſts "had made great cavities, that ſome of the "poles were directly north-eaſt, and in two "places directly eaſt and weſt." So far he. The Society has given me order to recommend to Mr. *Bagnall*, one of our body, and of power, as is ſuppoſed, in *Angleſey*, that he would get the rock there cut, and ſome innermoſt pieces ſent hither: which I intend, God willing, to perform, as ſoon as poſſibly I can meet with the perſon.

WE have now conquered the difficulty of bleeding one animal into another. Some perſons, appointed by the Society, performed the operation firſt by themſelves upon a couple of ſheep, with good ſucceſs, as they reported: but then they did it yeſterday, before the Society, very ſucceſsfully alſo, upon a bull-maſtiff, and a ſpaniel, the former being the emittent, the other the recipient. It took up ſo much time, that there was very little left to conſider and diſcourſe of the improvement, eſpecially there being ſo many perſons to be balotted, whereof five were to audit the account, and three more to be received into the Society, which were, the lord Privy Seal, the biſhop of *Lincoln*, and Mr. *Mercator*; (my lord *Manchester*, and my lord *Carliſle*, having been alſo not long ſince elected into that corporation.) Colonel *Blunt* preſented the company with ſeveral not diſpleaſing particulars; with two ſorts of Engliſh wines, new and old; with excellent ſcorzoneras, which he ſaid might be propagated in *England*, as much as parſnips; with a pea, of an almoſt incredible fertility; and with a ſpirit of cherry wine, of a ſingular ſtrength.

FOR news, there is not very much at preſent. We have almoſt every week a fire. Our peace will be ſtrangely hindred by *France*. The money to carry on the war is debated of (as to the moſt ſatisfactory way of raiſing it) with great deliberation, but not without ſcratching. The building work is cool for the preſent, but will quickly grow warm again, as ſoon as the way of raiſing the money is once reſolved on, and the method of building determined. Our winter fleet is ready to go to ſea, and to fetch home the Gottenberg fleet, ſo neceſſary for our next ſetting out againſt our enemies.

DR. *Beale* went this day out of town, much diſſatisfied with what has paſſed in Mr. *Hopton*'s cauſe.

I HUMBLY thank you, for your permiſſion of printing the Mine-Enquiries; and I am,

SIR,

your very faithful

and humble ſervant,

H. O.

THE

THE proclamation for baniſhing Romiſh prieſts and Jeſuits, and for putting the other laws againſt recuſants in execution, is publick: and two others will ſhortly follow; one againſt French commodities; the other againſt Canary wines.

London, Sept. 3, 1667.

SIR,

I WAS ſo ſtifled by the priſon air, that as ſoon as I had my enlargement from the *Tower*, I widened it, and took it from *London* into the country, to fan myſelf for ſome days in the good air of *Craford* in *Kent*. Being now returned, and having recovered my ſtomach, which I had in a manner quite loſt, I intend, if God will, to fall to my old trade, if I have any ſupport to follow it. My late misfortune, I fear, will much prejudice me; many perſons, unacquainted with me, and hearing me to be a ſtranger, being apt to derive a ſuſpicion upon me. Not a few came to the *Tower*, merely to enquire after my crime, and to ſee the warrant; in which, when they found, that it was for dangerous deſigns and practices, they ſpread it over *London*, and made others have no good opinion of me. *Incarcera audaciter, ſemper aliquid hæret.* Before I went into the country, I waited on my lord *Arlington*, kiſſing the rod. I hope, I ſhall live, fully to ſatisfy his majeſty, and all honeſt Engliſhmen, of my integrity, and of my real zeal to ſpend the remainder of my life in doing faithful ſervice to the nation, to the very utmoſt of my abilities. I have learned, during this commitment, to know my real friends. God almighty bleſs them, and enable me to convince them all of my gratitude. Sir, I acknowledge and beg pardon for the importunities I gave you at the beginning; aſſuring you, that you cannot lay any commands on me, I ſhall not cheerfully obey, to the beſt of my power.

THE box, you mention, I doubt, is only addreſſed to me for another, who, I gueſs, is Mr. *Shirley*; conſidering, that he and I engaged a friend (that went over with our ambaſſadors to *Breda*) to make it a part of his buſineſs, to find ſome of the ludus at *Antwerp*, (whither he intended to make an excurſion) and having found a quantity, to ſend it over, directing it rather to me, whoſe houſe is well known, than to M. *Shirley*, who is now releaſed of his military commands, and reſolved to fall to his practice of phyſick in good earneſt, being very much your ſervant. If you pleaſe, Sir, you have the freedom to open the box, and then ſend it to me, together with your judgment of its being the genuine ludus, or not. I come but juſt now out of the country, ſo that I have ſeen no body ſince my return, nor heard of any news, but the change of the lord chancellor. Certainly my friends abroad think me either dead, or very ſick; which will oblige me to haſten the renewing of my commerce, thereby to obtain the better occaſion to expreſs myſelf,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

MY hearty ſervice, I pray, to Dr. *Wallis*, and thoſe other friends of mine, that perhaps may enquire after me.

London, Sept. 12. 1667.

SIR,

THOUGH it be above a fortnight ſince I gave notice to ſome of my correſponding friends, that I was returned to my former ſtation, yet have I received as yet no anſwer from any but yourſelf and Dr. *Beale*, (for which I am the more obliged to you) which makes me conjecture, that foreigners, eſpecially in the neighbouring parts, may be grown ſhy to reaſſume that commerce they were wont to entertain with me, out of ſome tenderneſs and concern for my ſafety, which they may judge may be endangered as well by their freeneſs of writing to me, as by mine of writing to them. But I intend to take them off from ſuch apprehenſions, if I find really they are poſſeſſed with them, by confining our communications to matters of a philoſophical nature; or, if there be a mixture of civil things, to ſuch of them, as cannot be miſinterpreted, or ſuſpected of any ill deſign.

THE transfuſing experiment, I find, grows famous; our friend at *Yeovill* offering ſome ſubjects to try it upon. They are, one a gentleman of the biggeſt account of that country, and a ſad example of draining away too much of his blood (to allay the diſtemper of his brain) now emaſculated, and for theſe many years changed from the moſt haughty and couragious temper to the moſt puſillanimous: it is Sir *John Stowell*, elder brother to the high ſheriff colonel *Stowell*. Perchance a ſupply of lamb's blood had done better, or might yet give ſome degree of recovery. But younger brothers perhaps would not be much obliged for the performance of ſuch cures, no more than cardinals will for the confirmation of the health of popes this way. Another in the ſame country is one Mr. *Thomas Hawker*, who hath been outragiouſly diſtracted above a year, upon whom two famed empericks have had their turns in trying all old ways in vain. Concerning this latter our friend ſaith, that he believes he could perſuade his wife to ſend him to *Oxford*, ſhe being well able and willing to gratify the phyſician. Sir, think of this, I pray, and give me your advice, when you ſhall have communicated it with ſome of thoſe, that are verſed in making the experiment, and have been informed, how ſucceſsfully this trial hath been already made upon men, both ſick and well at *Paris*.

DR. *Beale* adds in theſe very words, "We "do extremely want Mr. *Boyle*'s diſcourſe of "heat and flame, and his other good pro- "miſes:" and he adds this query, "Did we "not hear of ſubordinate forms and qualities "to be adjoined to the reimpreſſion of Hy- "droſtaticks; and of the other part of Uſe- "fulneſs, and of more Pneumaticks?"

I ANSWER him, that you muſt be left to go your own pace, which is faſter and to more purpoſe, than that of any naturaliſt within ken. Mean time, Sir, if you have any of thoſe ſubjects in the preſs, I hope you will favour me with informing me of it.

SIR, if you have thoſe papers of mine I received from Mr. *Colepreſſe* by you, I would beg the return of them to me, who have now occaſion for them, though Mr. *Martyn* is ſcrupulous afreſh to continue the printing of the Tranſactions; and that forſooth, becauſe the book, printed in June (that diſtracted month) ſold ſo ill, as to make him loſe by it. The moroſity and fickleneſs of theſe men is mighty tedious to me. I wiſh I had another way for ſubſiſtence. I ſhould be, if I know myſelf well, generous enough to let them have it upon their own terms.

I WOULD gladly know, whether Dr. *Willis*'s book *de Scorbuto* be near furniſhed to be printed. I hear Dr. *Needham*'s *Diſſertatio de fœtu formato* will come abroad ere long.

DR. *Shirley* wiſhes you here, as well as others of your friends. The box of the ludus is not yet come to the hands of,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, Sept. 17, 1667.

SIR,

YESTERDAY, when I received the favour of yours, I received alſo the firſt foreign letter ſince my enlargement; which puts me in good hope of re-eſtabliſhing my former philoſophical commerce. By it I perceive the Pariſian virtuoſi employ themſelves much in anatomical diſquiſitions. They have lately made diſſections of ſome fiſhes, and of a lion, the account whereof I look for in part by the firſt opportunity. At *Caen* they have diſſected the eye of an owl, which alſo I expect the particulars of. Monſieur *Steno*, I hear, has publiſhed a treatiſe *de motu Muſculorum*; and *Godartius* an addition to his book *de Inſectis*; another Dutchman being alſo at work upon the ſame ſubject.

I KNOW not, whether during my confinement, you had, or heard of the *Tetras anatomicarum epiſtolarum Malpighii (Siculi) et Fracaſſati (Piſani) de lingua et cerebro*; together with an exercitation *de omento*. It is in print, and written for by me, to be ſent over. I pray, Sir, if you can conveniently, order the injecting into the veins of a dog ſome oil of ſulphur, and ſee what will be the conſequence of it, and obſerve particularly, whether the dog will feed with an extraordinary avidity upon it. I wiſh alſo, that an injection might be made with oil of tartar; and in caſe the dog die (as it is like he will) that he may be opened, and his blood well obſerved.

THE Royal Society hath not met theſe two months, but I hope they will ſhortly meet again. I know not, what deadneſs there is upon the members of it. I intend to urge, God willing, that thoſe, who have hitherto appeared to be cordial for the advancement of its deſign, may combine together with a new zeal, and try to inſpire the like concern and fervor into others, that have been cool enough hitherto, to the end, that ſo noble and uſeful an inſtitution may not fall to the ground, in an age ſo full of knowledge and curioſity, and enjoying ſo conſiderable advantages to improve and increaſe the ſame.

SIR, how declining ſoever the words of your laſt letter ſeem to be, as to the publiſhing of thoſe good things, you are known to have yet in ſtore, I am confident, you cannot obtain of your generoſity the hiding of your reſidue of your talent. And I ſhall be very glad to ſee what you have retrieved of your treatiſe of Heat and Flame, and, if you will allow me, to communicate the liſt of thoſe experiments to the publick, to provoke others to make trials accordingly. I humbly thank you for the copy of the augmented treatiſe of Forms you intend me; and I am perſuaded, the Society would take it very ill, if you ſhould paſs them by, without preſenting them with an exemplar of the ſame. I intend one for Dr. *Beale*, as ſoon as any member of them comes hither, he being one of the moſt inquiſitive men after all your productions.

MR. *Colepreſſe*'s papers to me will certainly be found in your ſcrutore, ſince I cannot find them, upon the ſearch through all my papers: and I remember, that though I mentioned them once, and you were ready to return them me, yet I ſtopped you, ſaying, I had not yet occaſion for them.

FOR civil affairs, we look every day for the arrival of the Dutch embaſſadors; and I wonder, they were not here ſooner to prevent Monſieur *Ravigny*, who is ſaid to endeavour a ſtricter alliance between us and *France*. It is diſcourſed, that the United Provinces have furniſhed great ſums of money for the defence of the Spaniſh provinces, for which they are to receive by way of ſecurity, *Antwerp* and ſome others of the Spaniſh towns; which, if true, how it will ſerve to keep the peace between *France* and *Holland*, I underſtand not.

MY Pariſian friend hath theſe particulars:

1. *Le roy eſt maitre d'une bonne partie de la Flandre, et en eſtat de pouſſer ſes conqueſtes bien plus avant.*

2. *Monſieur de Turenne fortifié Deynſe, et à des troupes à Aloſt pour incommoder les ennemis & ruiner leur quartiers. Cependant, l'armee ſubſiſtera en Flandres des contributions, et le roy ne ſera pas obligé de faire de grandes deſpenſes.*

3. *Les*

3. *Les princes du Rhin ſons dans nos intereſts.*

4. *La Suede doit envoyer Monſieur de Dona pour travailler à la paix: le pape s'en meſle auſſi; mais avec tout cela on ne croit pas, qu'elle ſe face.*

5. *Le ſiege de Candie continue toujours: ceux de la ville ſe defendent vailliament. Il y à quatre mois, qu'ils reſiſtent au Grand Viſir, qui avoit pres de* 60,000 *hommes.*

6. *Le G. Seigneur veut, que la Pologne rompe avec le Moſcovite, et qu'elle laiſſe les Coſaques en paix, qui ſont ſoubs ſa protection: cela obligera l'empereur d'avoir des troupes ſur la frontiere.*

THE duke of *York*'s ſon was baptiſed Sunday laſt, and named *Edgar*. This maketh many look back upon that brave Saxon king *Edgar*, who reduced *ſeculo decimo* (if I miſtake not) the Saxon heptarchy into a monarchy, and had a very numerous fleet, conſiſting of above three thouſand ſhips, with part of which he ſailed every year in perſon round about theſe iſlands, ſcouring them from all pirates. He alſo preſſed very much the due execution of juſtice, and bound all his judges with great ſtrictneſs to an entire performance of their duty in that particular. It is the ſame, that is ſo famous for making ſo notable a game of his falſe favourite *Ethelwoolf*, becauſe he had ſo deceitfully uſurped from him the fair *Elfrida*, to whom he was ſent by *Edgar* to view her celebrated beauty, and to engage her for his nuptial bed, if the thing agreed with the fame. I leave you to think the reſt, remaining,

SIR,

your very humble ſervant,

H. OLDENBURG.

DR. *Shirley* is now with me, and your humble ſervant.

MY humble ſervice to Dr. *Wallis*, I pray, to whom the communication both of the philoſophical and civil part of this letter will perhaps not be unacceptable.

I DO not find by your laſt letter, that ſuch an attempt of transfuſion, for which I ſuggeſted in my examples in my former, will be undertaken by any body there.

London, Sept. 24, 1667.

SIR,

I LAY hold of your favour, which engages you to be particular at your next conveniency of writing; as alſo to allow me a copy of Mr. *Colepreſſe*'s papers, which I may be able to acknowledge with ſome others from the ſame hand. I hope, Sir, you will be pleaſed now and then to furniſh my Tranſactions with new philoſophical enquiries, they proving ſo uſeful to the publick, and ſo exciting the thoughts and diſquiſitions of ingenious men. Mr. *Martyn* is now printing the Tranſactions of this month, which will compriſe alſo the two next precedent; and contain in the beginning an animadverſion on the Engliſhed letter of Monſieur *Denys* concerning the transfuſion; which tranſlation I diſown for mine, inſcribing this tract with num. 27. which the ſtationer too boldly preſumed to give to that tranſlated letter.

I HOPE, my cenſure on the there mentioned ten years conception before its birth here in *England*, will ſatisfy thoſe ingenious gentlemen of *England*, that are concerned in that invention; of which I alſo diſcourſed lately with Dr. *Lower*, who gave me a kind viſit, and took occaſion to ſpeak of that particular; whom I aſſured, that I had no hand at all in the tranſlation of that letter; which I was ſo far from, that though I had the French original before any body had it in *England*, which was the ſame day of my confinement, yet would I not impart it to any perſon, becauſe I fully intended not to publiſh it without ſuch an animadverſion, as I now have ſent to the preſs. Mean time Mr. *Martyn* deals very mercenarily with me; for knowing, that others will hardly undertake the printing of theſe papers, now ſo many of them have been printed by ſeveral, which renders it difficult for one to complete them, without redeeming the intereſt of others; he knowing this, I ſay, hath conſtrained me to abate him the rate yet lower, ſo that after the proportion, he allows now, I ſhall hardly bring it to 30*l.* a year.

SIR, I find the now biſhop of *Saliſbury*, Dr. *Ward*, is concerned for me; and I know, that he hath occaſions to advance perſons to beneficial employments, and that frequently there fall places, that come to his knowledge, and for the ſupply whereof his advice is deſired. If it were not, that you muſt employ an amanuenſis, I could preſume to intreat your favour of recommending me to him, and to his remembrance, in caſe any ſuch place ſhould fall, that he ſhould hear of, and think conſiſtent with my office to the Royal Society.

JUST now comes in the French poſt, acquainting me in a letter with the following particulars.

1. *On ſe prepare icy à la guerre plus que jamais. Le roy aura plus de* 80,000 *hommes l'année qui vient, et il ſera en eſtat de reſiſter à tous ceux, qui voudroient s'oppoſer à ſes deſſeins. Il ſemble, que les Suedois meſmes ont de la jalouſie de ſes conqueſtes, auſſi bien que pluſieurs autres princes. Meſſieurs les eſtats ne ſont pas peu en peine.*

2. *Les Eſpagnols offrent aux Provinces Unies, de leur mettre les places de Gueldres entre les mains, moyennant une ſomme conſiderable, qu'ils leur donneront.*

3. *Le pape veut eſtre le grand mediateur de la paix. Mais on aura de la peine de ſe fier à luy. Cette paix ſera aſſez difficile à faire, parce qu'on ne peut donner aucune ſeureté, que l'Eſpagne demandera en quittant ſon pays, et en donnant ſatisfaction au roy.*

4. *Monſieur de Roquelaure ira en embaſſade en Angleterre.*

5. *On croit icy, que la flotte Americane d'Eſpagne eſt arrivée.*

6. *Les*

6. *Les Tartares, les Coſaques, et les Turcs marchent pour entrer en Pologne. Ils veulent attaquer Kammel-podoſki. Les Turcs ſont aſſurez de la Volinie, Podolie et de l'Ukraine. Les Polonois ſont diviſez, et n'ont que* 15 *ou* 20,000 *hommes. Enfin, ce pauvre pais là eſt à la veille de ſa ruine. Avec le temps, ſi les Turcs en ſont maiſtres, ils ne laiſſeront pas l'Allemagne en repos.*

7. *Candie ne pourra pas reſiſter long temps. L'Europe, qui ſe va affoiblir, pourra bien avec le temps avoir ſujet de craindre.*

8. *On travaille à executer un arreſt en parlement, qui ordonne, que les moines, qui ont du bien, ne prendront plus d'argent, ny de penſions viageres. Ceux qui ſont pauvres, ne prendront que ces rentes viageres, et point de dot. On reglera auſſi le nombre, qui doit eſtre dans chaque couvent.*

9. *Nous aurons la ſeconde partie du code dans* 3 *mois, au pluſtard.*

A FRIEND of mine here informs me, that the Dutch embaſſador at his late audience of Conge at *Paris*, inſiſting, that that king would pleaſe to expreſs himſelf ſomewhat more clearly as to his pretenſions to the Spaniſh Netherlands; the king anſwered, he had already declared himſelf plainly enough as to that matter, and proteſted, that he pretended no farther than to what was in the preſent poſſeſſion of the king of *Spain*. Whereupon the embaſſador deſiring, that the declaration might be verified in parliament, the king replied, that he gave his parole for it: but the miniſter urging the verification, the king at laſt anſwered, *ſi vous ne voulez pas prendre ma parole, prenez vos meſures.*

I RECEIVED very lately a letter from a new correſpondent in *Milan*, Signior *Septalio*, a very knowing and curious gentleman. By him I underſtand, that M. *Steno*'s book, entitled, *Elementorum Myologiæ Specimen, ſeu Muſculi Deſcriptio Geometrica*, is now publick, dedicated to the great duke of *Tuſcany*. The other particulars in this letter, you are like to find in the Tranſactions, which are now a printing by the care of,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

MY humble ſervice, I pray, to Dr. *Wallis*.

London, Oct. 1, 1667.

SIR,

THE two books, you mention in your laſt to have ſent by the coach the day before the date of your letter (which muſt be Thurſday laſt, the ſaid date being of Sept. 27.) are not yet come to hand. When they do, they ſhall be diſpoſed of, God permitting, as you have ordered me. I humbly thank you both for the preſent of one of thoſe books, to be furniſhed by M. *Heringman*, and for the communication of the four paradoxes concerning flame. If they were not forbid to be made publick, they would certainly kindle many of the curiouſeſt of philoſophers to try concluſions. But you may be ſure, I ſhall keep them ſecret, as long as I receive no leave to divulge them. The like you may be confident of, whenever you ſhall pleaſe to impart to me thoſe wild heads, as you term them, of your Sceptical Naturaliſt.

THERE is a certain gentleman, a florid writer, one of our royal collegiates, who intends to print ſhortly ſome paralipomena, relating to the hiſtory of our Society; wherein he means to take more notice of the performances of ſome eminent members thereof, than hath been done by M. *Sprat*, and farther to recommend and vindicate the modern experimental philoſophers, by repreſenting the advantages of this way of trials, both for light and uſe, above that of former times. It had been extant, I find by his letter, ere this, but that he ſtayed for M. *Sprat*, to ſee what room he would leave for his thoughts; and finding now, that he hath not throughout prevented him, he ſeems reſolved to purſue his deſign, though it will make not above half a dozen ſheets, and therein to acknowledge ſome grand contributions to philoſophy, that have been omitted by the other. This is but juſt, and hath therefore received encouragement from me, together with the ſuggeſtion of ſome particulars, which this author could not be acquainted with, ſo well as the ſuggeſtor.

I HOPED to have here included the Tranſactions of September; but they are not yet come from the preſs. They will be to morrow, I think; and then the ſtationer will take care to ſend ſome of them to *Oxford*. There are mixed, among the contents, ſome experiments and obſervations, ſent out of *Italy*, and from *Meſſina*, about injections into veins, the tongue and brain, the optick nerve in fiſhes, *&c.* which perhaps will not diſpleaſe you. There is alſo an account of Dr. *Needham*'s new book *De Fœtu*; to whom I ſhall deliver any thing, you command me. I could not, ſince I received your letter, ſee Mr. *Crook*; but as ſoon as I can, I ſhall diſcharge your commiſſion. I did, very lately, among other things, ſend to *Paris*, being ſolicited to do ſo, two of your books in Latin, that of Colours and the Phyſiological Eſſays. Methinks, that the experiments of the air in the rarifying engine ſhould have a ſecond edition, as well as the Eſſays, it being altogether out of print. I am ſure, I can get none of them, ſince I have lent my exemplar to one, who forgets to return it, as well as I have forgot, who he is.

MR. *Glanville* hath ſent me an anſwer to ſome of the mineral enquiries, formerly printed in the Tranſactions, and promiſeth more. I think, I muſt now publiſh ſome of thoſe anſwers, that it may appear to the world, how uſeful the publication of ſuch queries is to the increaſe of knowledge: elſe they are apt to ſay, he fills his books with queries, but we never ſee an anſwer to any of them.

FOR ſtate news, there is but little at preſent, that I know. The act againſt importing cattle out of *Ireland* is enforced by a proclamation,

on, deſigned to prevent fraud and colluſion. Moſt people here look for an act of comprehenſion; but how far it ſhall extend, and whether it ſhall take the ſubjects of this favour into the church, and to church livings, or only tolerate them in the free exerciſe of their way, is yet uncertain.

THE French king appears more and more to have vaſt deſigns. He graſps on all ſides, *Germany*, *Italy*, and *Catalonia*, as well as *Flanders*. The prince of *Condé*, and the duke of *Enguien*, his ſon, are to command an army of twenty thouſand men in *Germany*, monſieur *de Turenne* having induced his maſter to give the ſaid prince that command. The duke of *Orleans* is to be general in *Catalonia*, and the duke of *Savoy* in *Italy*: ſo that we are like to ſee great actions next ſummer. *Sweden* cannot but look upon this war as very advantageous to them, and likely to make them to be courted by both ſides. How *Holland* will be able to keep themſelves from engaging in it, appears not, at leaſt to me; and what *England* will do in reference to it, I ſuppoſe, very few can tell. The emperor is now reſolved to ſend a conſiderable army into *Flanders* for their relief; and it is affirmed, that *Germany* hath incorporated the Spaniſh Netherlands into the empire, and will therefore appear in the defence thereof, as a member of it.

SUMMONS are this very day ſent about for re-aſſembling of our Society on Thurſday next in *Arundel* houſe. And though the council expreſſed to Mr. *Howard* their tenderneſs and ſcruple of continuing their meetings there, ſeeing his ſons are come home, who need many rooms with their attendants; yet is the Society urged by that noble perſon to go on there, as they have begun, alledging it to be an honour and reputation to him, to do ſo. Some of us are ſo ſanguine, as to believe, we ſhall have a college of our own erected before the end of next ſummer. I know many infidels, in this caſe, of whom he profeſſes himſelf to be one, that is,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

London, Oct. 8, 1667.

SIR,

I RECEIVED the two gilt books the next day after my laſt to you, and I have preſented them both, *præmiſſis præmittendis*, as you ordered me; and both the Society and my lord *Brounker* enjoined me to return you their hearty thanks, expreſſing withall their kind reception of it. The ſame day was preſented them Dr. *Needham*'s diſquiſition on the *fœtu formato*. He was lately elected into the Society, as Sir *Maurice Berkley* was propoſed candidate on Thurſday laſt: which meeting, though it was deſtitute of experiments; yet was it not ill ſpent, in taking account of the many communications, both foreign and domeſtick, that were come to hand during the vacation. Among the foreign were thoſe of *Malpighi*, *Fracaſſati*, and *Septalio*, as alſo that of Sir *William Curtius* about a kind of maſtick, made by ants in *Franconia*, in *Sylva Ottoniana*, which was looked upon as a new diſcovery. Both the matter itſelf, and the deſcription of it, you will find here at your return. The domeſtick came from Mr. *Glanville* and Mr. *Colepreſſe*, both concerning mines; and from one Mr. *John Burton* of *Norfolk*, who being encouraged, as his letter to me intimateth, by our Hiſtory and the Tranſactions, imparted ſome obſervations of his, deſcribed in Latin, 1. *De gallina Indica nummulos deglutiente, quorum planè lævigata fuit ſuperficies, ne minimo quidem effigiei regiæ veſtigio relicto.* 2. *De aqua petrifica in loco quodam nemoroſo, plano, & uliginoſo Norfolciæ*, called *Deepham*. 3. *De tumulo mobili in ſtagno aquæ reſidis*, in the ſame country. Of all which you may ſee the particulars at convenient time and place.

DR. *Beale* hath ſince recommended and much preſſed the conſideration of the aids of hearing, taking notice of a long, deep, narrow and dry trench (which was intended for an aqueduct) in a low vale, wherein he received and diſtinguiſhed audibles very perfectly; not being able to hear any noiſe at all, at any diſtance from that trench. Some like aid, he ſaith, he had from a wood of very tall and old oaks upon a higher ground (not a hill) about a mile diſtant from that trench. He is of opinion, that the beſt time to try the trench were in the ſilence of the night and of the winds: and for the woods, when the froſt hath ſtripped them of their leaves, and perchance when the ſap is leaſt buſy.

AGAIN, for odors, the ſame perſon repreſents, that the theory of it may be much better perfected, than we have yet ſeen it; adding, that ſome of human race, by ſlender diet, drink of water only, bread, and food of little odor, clean lodgings, *&c.* may have (for ought we know) a more univerſal extent in ſmelling, than dogs or vultures: where he inſtances in himſelf, how ſubtle his ſmell was, when he was accuſtomed only to drink water mixed with a very ſmall quantity of wine; the like not being to be looked for from beer-drinkers and high feeders. He would have us enquire the ſeveral degrees of ſmelling in vulturs, ravens, cormorants, kites, hounds of ſeveral guizes and ſizes, and ſpaniels, *&c.* and their anatomical differences in their narine parts, pores, or moiſture adherent within or without; what animals diſtinguiſh flowers, as we do; and how ſome odors do become ſo pleaſing to ſome, and ſo intolerable to others, *&c.*

HAVING diſcourſed of theſe and the like particulars, he tells me, that I would oblige many, if in my next Tranſactions I would give a brief liſt of all your writings in publick, what in Engliſh and what in Latin, in what volume, and what later editions; where he mentions the Experiments of Air, *&c.* reprinted with additions, againſt *Hobbes* and

Linus, all in one volume, in 4to; which laſt, I confeſs, I have not ſeen.

AFTER this, he concludes thus; "If we had his Dialogue of Heat and Flame; his Experiments concerning the Nature of Fire; his Sceptical Naturaliſt; his Eſſays of Spontaneous Generations, and the improbable Truths; there would be work enough for all the tongues and pens in both our univerſities; and fully ſufficient to rout all their notions concerning the generalities of nature."

SIR, I cannot but expect your declaration hereupon. I could not yet come to ſpeak with Mr. *Crook*; but I ſhall bear in mind your concerns. I am glad, you will ſay ſomething in anſwer to Dr. *Beale*'s former queries about ſome particulars in your book of Cold. I am confident, he will be very glad of an exemplar of the ſecond edition of Forms and Qualities; which will make me preſume upon the intimation given in your laſt, to beſpeak one for him from M. *Herringman*.

SIR, if you look for civil news, I can tell you, what my Pariſian friend writes; *viz.*

1. *Tout le monde attend avec impatience la reſolution, qu'on prendra dans voſtre iſle pour l'affaire des Païs Bas. Toute l'Allemagne eſt en armes. On croit, que les electeurs de Baviere & de Saxe ne ſeront pas pour nous, non plus que les Suedois. Cela ne nous fait pas peur, parce-qu'on aura une armee conſiderable en Flandre, & deux autres, au moins, en Allemagne & en Catalogne, pour attaquer la maiſon d'Auſtriche par tout.*

2. *Les Hollandois ne s'endorment pas, & ils ne peuvent ſonger au voiſinage de la France, qu'avec frayeur, craignant qu'on n'ait deſſein de ruiner leur commerce, & de demander les places du Braband.*

3. *On a cenſuré à Rome la traduction du nouveau teſtament de meſſieurs du Port Royal.* (Theſe you know to be the Janſeniſts.) *Il y a* 12. *docteurs de Sorbonne, qui l'examinent. Peut eſtre, que par complaiſance ils pourront bien auſſi la condamner, quoy qu'il n'y ait que de petites fautes.*

4. *Nous aurons bientoſt un traitté pour faire voir, que le roy peut fixer le nombre des Moines, parce qu'il eſt maiſtre de la police eccleſiaſtique & executive des Canons.*

I FORGOT, in the philoſophical part of my communications, that a curious Pariſian writes me word, that ſome ſubſtances were ſent to *Paris* from *Tholouſe*, much reſembling teeth, and for their extraordinary bigneſs, reputed to be the teeth of a giant. But, after examination, it was found to be a *luſus naturæ*. Expoſing it to the fire with ſpirit of wine, they make now blue ſtones of them, as fair as topaſes, which they wear in rings.

THE experiment of transfuſion was tried at *Paris* upon a baron of *Sweden*; but he dying, his inteſtines were found all gangrened, ſo that it was not poſſible to have recovered him by any known natural means. This invention is hugely diſputed abroad pro and con; of which I alſo received lately ſome ſpecimina in print, both French and Latin; whereof he may ſhortly give a fuller account in publick, who is,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London fills extremely both with people and with expectations from the parliament, in reference chiefly to the chancellor and the church.

London, Oct. 15, 1667.

SIR,

AS I return you my humble thanks for your favour of imparting to me the relation about the growth of a magnet, ſo I am fully of your opinion, that it ought not to be publiſhed till farther confirmation. When your leiſure will permit, I doubt not, but you will endeavour to ſatisfy Dr. *Beale* in the particular about the liquor of amber.

SIR, the declaration deſired of you in my laſt, refers only to Dr. *Beale*'s motion about publiſhing a liſt of your writings, already printed; you formerly expreſſed your thoughts of what you have in ſtore, and of what is to be expected as to their publications. I think, that ſince there is a liſt of your printed books, as well as of others, half promiſed, in print already, *viz.* annexed to your Hiſtory of Cold, it will be better, if there be occaſion, to refer thither, than to reprint ſuch a liſt.

As ſoon as I can obtain the exemplars of your reprinted *Origin of Forms*, I ſhall diſpoſe of them as you have directed. I have not yet got thoſe two, you were pleaſed to allow me to call for, one for Dr. *Beale*, and one for myſelf, who would give ſome account of the appendix, in the Tranſactions of this month. I read to Mr. *Herringman*, what you ſaid about it in one of your laſt to me; and he again read to me another of Mr. *Maires* to him, importing, that he ſhould bind ſix of them, and ſend two of them gilt to my lady *Ranelagh*, and keep the reſt till farther order. I know not yet what was writ to him by the yeſterday's poſt. On Thurſday laſt we repeated at our meeting, that notable experiment of opening a dog, and laying bare his lungs, and blowing into him with bellows, keeping him thus alive as long as we pleaſed; which occaſioned ſome diſcourſe about the nature and uſe of reſpiration; ſome of the company declaring, that this experiment made out, what was not the uſe of reſpiration; others intimating, that it ſeemed to teach, that the principal end of reſpiration was the diſcharging of the fumes of the blood; the animal keeping alive, and lying ſtill, as long as the lungs were ſupplied, and kept extended with freſh air; and falling ſoon into convulſions, when we ceaſed to blow.

AT our next meeting, Dr. *Lower* has promiſed to make the experiment of breaking a nerve of the diaphragm, to render an animal broken-winded.

MANY things come to my hands from all parts; but I want hands extremely to diſperſe them

them to my friends, as I wiſh. I am very buſy this day in making diſpatches, for ſeveral parts of the world, of divers books of our Hiſtory; and they muſt all be accompanied with letters: beſides thoſe, I intend to tranſmit to *Florence*, for prince *Leopold*; to *Madrid*, for the earl of *Sandwich*; to *Paris*, for our fellow-members there; to *Dantzick*, for *Hevelius*; I cannot but ſend alſo one to *New-England*, for Mr. *Winthrop*, having now a very good opportunity for doing ſo; and, at the ſame time, in my letter, ſolicit him to endeavour to ſeaſon the youth of *New-England* with our experimental philoſophy.

FOR matter of ſtate news, I ſhall only hint theſe particulars, that regard foreign parts; ſuppoſing you have what is domeſtick, from better hands.

FROM *Paris*,

1. *Les Eſpagnols negocient par tout. Ils eſperent, que la Hollande, la Suede, & le Brandeburg ſe declarerent pour eux. Ils n'attendent de l'Angleterre, qu'une neutralité. Ils ſe flattent, que Baviere pourra revenir, & eſtre pour eux. Les ducs de Lunenburg ont des troupes, & pourront bien eſtre pour la France, où ils ont un envoyé.*

2. *Le pape fait d'aſſez bonnes choſes; mais on ne croit pas, qu'il vive long-temps.*

3. *Nous avons de mauvaiſes nouvelles de Candie cette ſemaine, neantmoins ils ſe deffendent touſjours bien.*

4. *Un, nomme Aubry, qui avoit fait un traité des pretenſions du roy ſur l'empire, ſans aveu, à eſté mis à la Baſtille; le livre n'eſt pas bien fait.*

5. *Le duc de Loraine avoit tiré de l'argent de ſes ſujets, dans l'eſperance, qu'ils ſeroient neutres; mais le roy n'a pas voulu luy accorder la neutralité. Il leve des troupes pour ſe garentir, s'il peut, des incurſions des uns & des autres; mais il faudra, qu'il marche droit.*

ANOTHER friend in *France* writes this philoſophical particular:

Nos gens apportent du plomb de l'Amerique, qui eſt preſque pur metal. J'en ay donné à un homme expert dans cette matiere, qui en doit faire l'eſſay. Je vous diray ce qu'il en aura obſervé.

SIR, if I miſtake not, Mr. *Winthrop* gave you ſome ſuch, and not only of pure lead, but alſo of copper.

FOR all my haſte, I cannot let this go, without annexing the verſes, lately made by a philoſopher of *Paris*, (who is M. *de Monmor*) upon the preſent undertaking of his king.

Fulminat attonitas Scaldis Lodoicus ad arces,
Intrepiduſqne hoſtes terret & ille ſuos.
Dum tamen Auguſtum caput objectare periclis
Non timet, heu! populos terret & ille ſuos.

This was put into French, by *Corneille*, thus.

Sur l'Eſcault eſtonné tu lances ta tempeſte,
Grand prince, & fais trembler par tout les ennemis;
Mais quand dans les perils tu hazardes ta teſte,
Tu fais trembler auſſi ceux, que Dieu t' à ſoubmis.

I CANNOT review, but remain,
SIR, your faithful humble ſervant,
H. O.

I AM deſired to ſend to *Paris* a Chriſtian Catechiſm in Turkiſh; but I know not where they are to be had.

London, Oct. 24, 1667.

SIR,

SEEING publick affairs require ſome ſuſpenſion of your favour of communicating your news to me, I muſt ſubmit (though I ſhould be angry with almoſt any other but of that nature) and ſhall only wiſh a ſpeedy removal of this impediment. In the mean time, be pleaſed to receive my humble thanks for the kindneſs of your laſt bill to Mr. *Lindſey*; for which I ſend the encloſed diſcharge to Mr. *Davis*, according to your order. The tranſcript of the account of the burning-glaſs being alſo come to my hands, and being preſently inſerted into my Tranſactions, I do by this very poſt ſend them to Sir *R. Moray*, and, with them, the particulars, both political and philoſophical, I received yeſterday from *Paris*, and other parts, ſcrupling to interrupt you with prolix letters, during the time of the extraordinary diverſions you have lately met with. But this one thing I cannot omit to acquaint you with, as a thing hardly ever attempted afore, *viz.* that one Mr. *Thompſon*, a perſon, that is between a doctor and an apothecary, and hath the reputation of having done much good in this mortality, had the courage to open the body of one, that died of the plague; the conſequence whereof was (as it was related to me by ſeveral, and, among them, by a very honeſt and intelligent merchant, who, a month ſince, was by this very *Thompſon* recovered of the ſame diſeaſe) that when he handled the viſcera, and had his hands embrued with the blood, he ſoon found one of them much benumbed; which made him diſpatch the faſter, and to go home to bed, taking ſuch medicine, as he had provided and prepared for ſuch an event; and finding himſelf pretty well again the next day, he went abroad, but relapſed, and then apprehended himſelf in much more danger than afore; yet uſing his own remedies (which I hear are a powder, that is ſudorifick, and an excellent cordial) did perfectly recover, and hath ever ſince viſited infected perſons with great ſucceſs. Enquiring, whether he had obſerved any thing in that dangerous diſſection, I had this anſwer, from the ſaid merchant, that he heard him affirm, he had diſcovered ſome things, which, in due time, he would bring to light, looking upon them, as very conſiderable in the theory of the plague, and uſeful for the cure thereof.

I SHALL conclude with a requeſt, that you would pleaſe to gratify my lord *Anneſley* with ſending the encloſed to my lady his mother, to whom I underſtand, by letter from his governor, he hath written ſeveral times, without hearing a word of return. I ſuppoſe, her ladyſhip does viſit *Oxford* ſometimes, ſhe living ſo near it; or ſends frequently thither;

by which means this note of mine may eaſily be conveyed to her. I ſuppoſe alſo, that Mr. *Southwell* is, where you are; and it will be ſtill an encreaſe of your favours, to ſend the other letter, here annexed, to him, from,

SIR,

your faithful humble ſervant,

HENRY OLDENBURG.

I HAVE dated the diſcharge the ſame day, I ſuppoſe the firſt Tranſaction will be printed at *Oxford*, and left a blank for the name of the printer, in caſe it ſhould not be Mr. *Davis*.

THE notice you received from Mr. *Williamſon*, concerning injections, I gueſs to be ſent him from *Hamburgh*; and then they are very likely to be the ſame with thoſe I received a good many months ſince, which I did ſhew you, and afterwards lent them to Dr. *Clerk*, who hath it ſtill. One Dr. *Major* is the author thereof.

London, Nov. 12, 1667.

SIR,

I SHOULD be very glad to ſee you here upon many accounts, and ſome of them of a publick nature; and then poſſibly you might alſo take an opportunity of beſpeaking reaſon to M. *Crook*. I do not well underſtand, by what you ſay of the Uſefulneſs, whether it be an encouragement to make an end of the Latin verſion of what remains to be tranſlated of the Engliſh book already in print, or not. But am very much pleaſed to find, that you are about to communicate to the world the ſequel; concerning which I intreat you, that you would not let us want that eſſay, which you ſay tends directly to the deſigns driven by the Royal Society, who are now continuing a way to do ſomething, that may more nearly concern their perpetual eſtabliſhment.

WHAT you have commanded me on the behalf of Dr. *Beale* and Mr. *Colepreſſe*, I ſhall be very careful to perform. And Mr. *Glanvill*'s book I have ſent to Mr. *Hatherton* for you, according to your order.

DR. *Beale* hath lately ſent me ſome new barometrical obſervations, which are too long to inſert here, but may be thought proper enough to put into the Tranſactions of the next month; thoſe of this month being full already, and now in the preſs, whence they will come forth by the end of this week.

DR. *Lower* hath been making ſeveral trials amongſt us, of giving a dropſy to a dog in a very ſhort time, by tying up of the vena cava; which, it ſeems, hath given him matter enough to write a tract, that may, together with ſome other experiments, conduce much to the clearing up of the doctrine of Pathology. He, in conjunction with ſeveral others, are like to do philoſophy great ſervice by anatomical diſcoveries.

I FIND by letters from abroad, that the young prince of *Florence*, having left *Italy* to travel, is like to viſit *Germany*, *Holland*, and perhaps *England* too, and in doing the laſt, do honour to our Society, if Sir *Bernard Gaſcoigne*'s intelligence meet with no diſappointment.

THE particulars of the laſt French letters to me, are;

1. *Les experiences de Florence ſeront bientôt achevées. Nos libraires en feront venir aſſurement.*

2. *Nous attendons ce que reſoudra l'Angleterre et la Suede. Les eſtats de Hollande ont pris quelques reſolutions importantes, qui ſont fort ſecretes. Ils ſe preparent à tout evenement.*

3. *L'electeur de Brandenbourg et les ducs de Lunenbourg ſeront dans les intereſts de l'empereur. Les princes du Rhin ſont pour nous, et particulierement l'eveſque de Munſter, qui à fait demanteler ſa ville capitale.*

4. *Les Eſpagnols ont encore eſte battus en Flanders, et ont perdu bien du monde.*

5. *Il n'y à pas d'apparence, que la paix ſe face dans l'eſtat, ou ſont les choſes. L'Europe va retomber dans une guerre, qui achevera de la conſommer et de la perdre.*

6. *Les Tartares ſont venus à 18 lieues de Cracovie.*

7. *Candie à eſte ſecourüe: neantmoins le grand Viſir ne l'abandonne pas. Il eſt à craindre, qu' avec le temps elle ne periſſe.*

FROM *Dantzick* I underſtand by a letter of Mr. *Hevelius*, that his cometography is very near finiſhed; and that he intends very ſhortly to ſend me by ſea ſome exemplars thereof; together with a farther account of not ordinary obſervations concerning the Succinum.

ANY competent aſſiſtance would, by God's bleſſing, enable me to bring from all parts of the world into *England*, as to a centre, whatever ingenuities, diſcoveries, obſervations and experiments lye ſcattered up and down every where. But no man, that I ſee, does effectually conſider this, which muſt needs overwhelm and oppreſs,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

London, Nov 25, 1667.

SIR,

I AM reſolved not to ſhew myſelf ungrateful for the excellent entertainment I received from you this night, firſt by your paper of the experiments of Light, ſent by coach, but not delivered till this very evening; next, by your letter, referring to the ſame, and coming to my hands an hour after the ſaid paper. I take a folio ſheet, to try, whether I can in ſome meaſure be revenged of you, and fall to work this very evening, becauſe I much doubt, I ſhall want leiſure to morrow.

FIRST

FIRST then, receive my moſt hearty private thanks both for thoſe extraordinary communications, and for the liberty you are pleaſed to allow me of diffuſing them by the preſs, for their farther improvement by philoſophical men in all parts. Theſe private thanks of mine, I am ſure, will ſoon be followed by the publick ones of the Society, when I ſhall have expoſed them there, as I mean to do, God willing, on Thurſday next. And ſince I have your leave of making them publick (which certainly will be a ſingular gratification to the learned and curious) I ſhall endeavour to do it both in Engliſh and Latin in the ſame month, or as to the Latin, ſoon after. I deſire only your favour, to direct me a little more particularly about the diſtinct title page, you would have it publiſhed with; as alſo to enrich me, with all convenient ſpeed, with the reſt of the experiments of this ſubject, and thoſe other experimental things you mention you had to add, but could not ſend them by the laſt; becauſe I am now ready to compoſe the next month's Tranſactions, and would by no means have this part of yours omitted therein, they being to be read in the Society ſo ſoon, and the uſurpation of others to be timely prevented. I long alſo to ſee that catalogue of the new way of ſealing of glaſſes, which I hope I ſhall at laſt find the underſtanding of, by the contumacy of my attention. And this, if you thought fit to give way, would alſo much pleaſe the Society for another meeting, entertainment.

ON Thurſday next, God willing, a report will be made of the good ſucceſs of the firſt trial of transfuſion practiſed on a man, which was by order of the Society, and the approbation of a number of phyſicians, performed on Saturday laſt in *Arundel* houſe, in the preſence of many ſpectators, among whom were Mr. *Howard* and both his ſons, the biſhop of *Saliſbury*, four or five phyſicians, ſome parliament men, *&c.* by the management and operation of Dr. *Lower* and Dr. *King*, the latter of whom performed the chief part with great dexterity, and with ſo much eaſe to the patient, that he made not the leaſt complaint, nor ſo much as any grimace during the whole time of the operation; in which the blood of a young ſheep, to the quantity of about eight or nine ounces by conjecture, was tranſmitted into the great vein of the right arm, after the man had let out ſome ſix or ſeven ounces of his own blood. All which was done by the method of Dr. *King*'s, which I publiſhed in num. 20. of the Tranſactions, without any change at all of it, ſave only in the ſhape of one of the ſilver pipes, for more conveniency. Having let out, before the transfuſion, into a porringer, ſo much of the ſheep's blood, as would run out in about a minute (which amounted to twelve ounces) to direct us as to the quantity to be transfuſed into the man, he, when he ſaw that florid arterial blood in the porringer, was ſo well pleaſed with it, that he took ſome of it upon a knife, and taſted it, and finding it of a good reliſh, he went the more couragiouſly to its tranſmiſſion into his veins, taking a cup or two of ſack before, and a glaſs of wormwood wine and a pipe of tobacco after the operation, which no more diſordered him, both by his own confeſſion, and by appearance to all by-ſtanders, than it did any of thoſe that were in the room with him. The pipe being taken out of the man, the blood of the ſheep ran a very free ſtream, to aſſure the ſpectators of an uninterrupted courſe of blood. The patient found himſelf very well upon it, his pulſe better than before, and ſo his appetite. His ſleep good, his body as ſoluble as uſual, it being obſerved, that the ſame day of his operation he had three or four ſtools, as he uſed to have before. This morning our preſident (who by very preſſing buſineſs could not be preſent in *Arundel* houſe) and I went to ſee him pretty early, and found him a bed, very well, as he aſſured us, and more compoſed, as his hoſt affirmed, than he had been before, he being looked upon as a very freakiſh and extravagant man; who hath ſtudied at *Cambridge*, and is ſaid to be a batchelor of divinity, called *Arthur Coga*, an indigent perſon, and receiving a guinea for undergoing the experiment; which reward maketh him willing to have it repeated upon him, wherein he will eaſily be complied with, and that, I think, before the end of this very week, if circumſtances ſhall perſuade it. But I doubt, I do here *actum agere*, and trouble you with the repetition of what Dr. *King* hath related in this annexed letter, which he deſired me to convey to you.

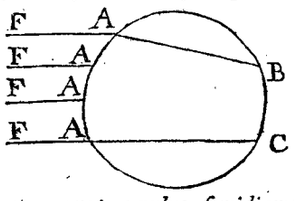
SINCE my laſt, I have received a packet of books from *Hamburgh*, *viz.* the *Prodromus Hiſtoriæ Literariæ* (after the model of Sir *Francis Bacon*) begun by Dr. *Lambecius*, now hiſtoriographer and bibliothecarius to the emperor: then the *Sarepta Matheſii*, and *Jungius*'s Logick; which are at your ſervice, when you ſhall be returned to *London*.

I RECEIVED alſo very lately a letter from one of the new correſpondents, an excellent mathematician, *Francis Renatus Sluſius*, at *Liege*, the author of the celebrated *Meſolabe*, who ſends me ſeveral particulars, whereof I ſhall preſume to trouble you with a couple, and communicate a third to Dr. *Wallis*, as moſt proper for his examination. Theſe two are concerning his ſenſe of our royal inſtitution, and a certain deduction from the Carteſian Hypotheſis of a rainbow. I ſhall give you both in his own words:

1. *Exprimere verbis non poſſum, quàm mihi jucundum acciderit noſſe ex literis tuis Regiæ Societatis inſtitutum. Dignum ſanè, cui quicquid eſt uſquam eruditorum applaudat, et quod communibus ſtudiis promoveat. Ejus enim virtute futurum exiſtimo, ut ſcientia naturalis pomœria (quod illuſtriſſimuſque Baconus optabat et enixè ſatagebat) in immenſum proferantur. Sed res, ut arbitror, non unius ætatis eſt, et ſemper ſupererit, in quo ſe exerceat grata poſteritas, ſi iiſdem ſtudiis teneatur. Non vanè enim mihi tecum augurari poſſe videor, hanc ſocietatem eſſe perennaturam. Apud nos, ut liberè tecum agam, frigent hæc ſtudia, et viri docti, juriſprudentia, vel aliis ſcientiis, quæ vulgo magis*

magis notæ ſunt, operam impendunt. Sunt quidem nonnulli chymiæ ſtudioſi, ſed vel medicinæ vel lucri cauſâ. Nemo, quod ſciam, naturæ arcana ſcrutatur, ut ea tantùm cognoſcat, ſi quos tamen in poſterum reperire me contigerit, eos ad tam præclaros conatus adjuvandos hortari non intermittam. Me quod attinet, pauca omnino promittere poſſum, variis curis diſtractus, ſed ſi quid occurrerit (neque enim ſpem omnem abjeci) optimâ fide tibi me relaturum polliceor.

2. *Leve eſt, quod addam in anteceſſum, licet fortaſſe hîc adſcribi non mereatur, cum non niſi ex hypotheſi verum ſit: non tamen ingratum accidet, ut ſpero, ſi hactenus non animadverteris. Si celeberrimi Carteſii doctrina circa iridem et refractionum menſuram admittatur, facilè experimento ſciri poteſt, dato liquore quolibet, angulus ſemidiametri iridis ex illo orituræ; ut ab annis bene multis oſtendi. Opponatur enim ſoli globus liquoris dati (vitro incluſus, nam hoc ſenſibilem differentiam non faciet) et retrò conſideretur pars illuminata: hæc tot gradus circuli maximi ejuſdem globi, bifariam ipſam ſecantis, complectetur, quot conſtat angulus quæſitus. In figura hîc adjuncta ſint radii ſolis paralleli FA, FA, &c. incidentes in globum, cujus ſectio per circulum maximum ſit ABC, qui refracti conveniant omnes intra ſpatium BC; erit arcus BC tot graduum, quot angulus ſemidiametri iridis, nempe 42. circiter, in aqua communi, ſecundùm Carteſii tabulas; quibus tamen, ut hoc obiter adjungam, non eſt opus; poteſt enim arcus ille geometricè determinari, et quidem per locum planum.*



I DOUBT not, Sir, but you will communicate theſe particulars to Dr. *Wallis*, as I believe he will not fail to ſhew you his.

I MUST haſten to annex my foreign ſtate-news, *viz.*

Les Hollandois ne ſcavent où ils en ſont, et ont de la peine à prendre parti, et à ſe reſoudre, avec qui ils traiteront, ou avec les Suedois, ou avec l'electeur de Brandebourg. Il y en à qui ſont d'avis de faire des levées, et d'avoir quarante ou cinquante millé hommes pour la conſervation de leur places frontieres et de leur voiſinage: mais les autres provinces ne ſont pas de cet avis là.

Les Eſpagnols font les fiers: mais ils trouveront à qui parler, et auront bien de la peine à empeſcher la perte des Pais Bas. Les princes d'Allemagne ne ſongent qu' à eux, et ne feront rien, s'ils ny trouvent leur compte (and who does otherwiſe?) *A la fin ils periront tous, et dum ſinguli pugnant, univerſi vincuntur. Ils le meritent. Il n'y à que le roy, qui ſache agir et regner.* (This is right French.)

La bruit court, que les Portugais ne ſont pas eloignez de faire la paix avec l'Eſpagne, ne la pouvant jamais faire en une conjecture plus heureuſe pour eux.

AT the end this correſpondent intimates to me, that that excellent perſon, Monſieur *Carcavi*, (who, he ſaith, is preſident of the new experimental academy at *Paris*) hath expreſſed a deſire to entertain a correſpondence with me. Which certainly I ought to embrace with all readineſs and particular acknowledgments. I ſee my paper fails me, though I could fetch another ſheet, and ſcribble it full, if it were not an hour paſt midnight, nor I to riſe to morrow early. This releaſes you from the troubleſom pen of,

SIR,

your very humble,

and faithful ſervant,

H. O.

How large and uſeful a philoſophical trade could I derive, had I but any competent aſſiſtance?

London, Dec. 3, 1667.

SIR,

SINCE the Society applauded ſo much, as they did at their laſt meeting, the experiments of light contained in your firſt paper (the ſecond being then not yet come to my hands, as now it is) you will, I hope, reform that thought of yours, which looked upon my reſentments of it as complimental. At their next meeting they will ſee, God permitting, that ſecond part, I have ſince received and peruſed, highly ſuitable to the firſt, and therefore ſure to meet with the like eſtimation. I am very glad, it is come ſo ſeaſonably, and juſt upon the order, which laſt Thurſday was made, of trying the experiment with compreſſed air, ſince it will appear to them, by your ſecond papers, that you are beforehand in that trial. I ſhall be very punctual in obſerving your orders about the liſts, and the ſet of queries about ſhining wood, and the ways of ſealing up glaſſes exhauſted of air, and all ſuch other particulars, as you enjoin me ſilence of. I thought indeed, and am confirmed in it, by looking upon your letter, of Octob. 17, that I had permiſſion to make mention of what formerly you had acquainted the Society with, concerning acid liquors injected; and if I went too far, in mentioning the clauſe about the anatomical matters, you have in ſtore, it was my reſpect to you, that carried me, and the conſideration, that if you ſhould perhaps be prevented by others in the publication of any of the ſame, you have lying by you, the general intimation I gave of ſuch matters, according to the hint of that letter of yours, might the rather incline others to believe, they were not unknown to you. However, I ſhall eſteem it a favour, when I chance to fail in exceeding my commiſſions, or the indulgencies allowed me (which I believe I ſhall be very ſeldom guilty of) if you would reſerve the reprimand for our perſonal meetings.

I HAD indeed prepared for enriching the Tranſactions of this month with your experiments of Light; but ſince you will have them deferred to the next, I am to acquieſce; being, mean time, very deſirous to ſee the liſt of your experiments tried in the ſealed

glaſſes exhauſted of air, and the methods uſed therein; which you may reſt aſſured ſhall be kept as ſecret, as you can deſire.

ON Saturday laſt (St. *Andrew*'s day) we had a very numerous meeting at *Arundel* houſe, never ſo great a one before; we being about threeſcore, and of them about fifty at dinner, for which his majeſty ſent in a doe, as Mr. *Howard* another; which I doubt will prove precedents for ever after, and thoſe not likely to be liable to diſpute, as ſome are in a high place. You, Sir, are one of thoſe, that were then elected into the new council; and the reſt are:

Lord *Aſhley*
Lord *Brereton*
Mr. *Charles Howard*
Sir *John Lowther*
Sir *Philip Carteret*
Sir *George Ent*
Mr. *Thomas Neile* (that married the rich widow)
Mr. *Hayes*
Mr. *Creed.*

The eleven, that are continued,

Lord *Brounker*
Biſhop of *Saliſbury*
Mr. *Henry Howard*
Mr. *Erſkin*
Sir *R. Moray*
Sir *P. Neile*
Sir *Anthony Morgan*
Dr. *Wilkins*
Mr. *Hoſkins*
Mr. *Colwall*
Oldenburg.

WE hope, we ſhall ſhortly enjoy your company. I have diſcourſed with M. *Martyn* about the printing the principal matters of the Tranſactions in Latin, with a ſmall letter, for a pocket book, that the Dutch may not be able to print upon him with advantage. This he ſeems to like well of, and ready to undertake. I want Sir *R. Moray* to deal with him about the conſideration, I think, I deſerve for the labour the verſion will coſt me.

I HAVE lately received very many letters and papers, ſtored with philoſophical matters, from *Antwerp*, *Dantzick*, *Sweden*, *Poland*, the *Bermudas*, and *Holland*. I am offered from *Antwerp*, what quantity I pleaſe to have of the ludus; only I am to ſend thither, in exchange, the philoſophical and medicinal books, that have been lately printed in *England*. I ſhall not refuſe that offer, you will eaſily believe, ſuppoſing, that thoſe perſons, that deſire to ſhare in it, will not be unwilling to refund my expences. Mr. *Norwood* at the *Bermudas* is certainly a ſolid, knowing and ſober man. It is he, from whom I have the communications come from that place; which you may command, when you come to *London*, they being too large for a letter, as alſo are thoſe, that were ſent me from the other places: only I muſt intimate to you, that among the papers, that come from the *Baltick*, I find one, written by a phyſician of *Dantzick*, relating, that there they have cured the *lues venerea*, and convulſions, by injecting liquors into veins: which I intend, God willing, to read at our next meeting, to occaſion the Society to urge Dr. *Clerke*'s publication of his experiments of that nature, though they come ſhort of ſuch effects. As far as I ſee, both thoſe experiments, that met with ſo much difficulty and contradiction at firſt (I mean that of infuſion and transfuſion) may at laſt prove very beneficial to the health of men. The perſon, that hath the ſheeps blood in his veins, is ſtill very well, and like to continue ſo. If we durſt believe himſelf, who is flatterouſly given, he is much better, than he was before, as he tells us in a Latin account, he brought in to the Society.

STATE news from abroad I received but little this week. What I had, was this.

Voſtre chancelier ſe ſauuera à la fin. (This is ambiguous.) *On ne parle plus de paix. Les Suedois doivent envoyer à une aſſemblée, qu'on doit faire à Brunſwick. Ils deliberent encore auſſi bien, que meſſieurs les Eſtats. Juſques a cette heure ils n'ont encore rien reſolu. Candie n'eſt pas ſi bien qu'on l'a cru. Nous ne ſcaurons rien des affaires que dans deux mois, tout le monde negociant & prenant ſes meſures.*

THE houſe of commons ſat yeſterday about the grand affair, till four at night; and then came to this vote:

"THAT the refuſing of the Houſe of "Lords to commit the earl of *Clarendon*, at "the accuſation of the Commons of *England*, "is an obſtruction to parliamentary proceed-"ings (ſome add, and to juſtice) and of dan-"gerous conſequence."

WHAT this conſequence will prove, and how they will further proceed in this matter, is hard to predict, to him, who is,

SIR,

your faithful humble ſervant,

H. O.

I DO not write this week to Dr. *Wallis*, becauſe I could not ſhew his letter, as he would have me, to my Lord *Brounker*, by reaſon of his lordſhip's abſence from *London*, he being now at *Chatham*, and like to continue there this fortnight, employed in paying off ſhips. Mean time, my humble ſervice to the doctor, I beſeech you.

London, Dec. 10, 1667.

SIR,

THE letter-carrier, inſtead of delivering your and other inland letters yeſternight, delivered them not till this day in the afternoon, when they found me at home, but in ſuch company, as were pleaſed to ſtay till a good while after candle-light; which hath deprived me of the ſatisfaction, I deſigned to allow myſelf in converſing more largely with you, than now I ſhall be able to do for want of time. In ſhort, I am firſt to acquaint you with the ſecond thanks of the Society, for your ſecond entertainment of them with your rare experiments about light. I am ſure, they will be very glad, to receive that third, you intimate to me in your laſt. Next, you will pleaſe to accept of my humble acknowledgments for the favours, you particularly deſign me, in communicating, for my

private

private ſatisfaction, your queries about ſhining wood and ſhining fiſhes, together with the experiments relating thereto. I confeſs, I think the time long, till I ſee the experiments tried in the ſealed receivers, imagining they muſt be no leſs inſtructive than delightful. Your ſervant certainly forgot to mention to me a book to be directed to M. *Hook* from *Herringman*. It will come time enough yet, if the bookſeller be but in a line or two written to, about it. I think, I mentioned in my former ſome of the heads of the particulars, lately ſent me from the *Baltick* by *Hevelius*, *&c. viz.* of the ſurpriſing effects of injections into veins; of obſervations of cold, amber, pot-aſhes, hints for new materials for optick glaſſes, *&c.* That part, which concerns the injections, was read at our laſt aſſembly, and containing an account of three perſons, it had been tried upon, whereof two received great benefit, but the third died (though that was by the perſon's own neglect,) a certain phyſician then preſent (elſe a learned and ingenious man) was to my great trouble, ſo precipitate, as to ſay, that he would engage, that that one, *viz.* with the ill ſucceſs, was only true, but the other two both falſe. I could not but take him afterwards aſide, and repreſent to him, how he would reſent it, if he ſhould communicate upon his own knowledge an unuſual experiment to the curious at *Dantzick*, and they in publick brand it with the mark of falſhood: that ſuch expreſſions in ſo publick a place, and in ſo mixed an aſſembly, would certainly prove very deſtructive to all philoſophical commerce, if the curious abroad ſhould be once informed, how their ſymbolas were received at the Royal Society. On Thurſday next the transfuſion, which was omitted at our laſt meeting, for want of fit preparations, is ordered to be made, and will doubtleſs have a croud of ſpectators; it being diſcourſed of in moſt companies one reſorts to.

THE foreign news of this week are:

1. *Les Hollandois ne veulent pas s'attirer la haine de la France, ny faire la deſpence de la guerre, comme la Suede, Brandeburg & Luneburg ſe l'eſtoient imaginé. Si le roy ſe veut contenter de la ſatisfaction, qu'il leur a fait propoſer, ils contraindront l'Eſpagne à luy faire raiſon. Cependant ils levent des troupes, & traiteront avec la Suede, à fin de n'eſtre pas ſurpris. Ainſi nous ſerons maitres de la Flandre l'année qui vient, les Eſpagnols ne faiſants rien, & l'empereur n'agiſſant pas luy meſme; ils ſont inſenſibles à leur maux, & il ſemble, qu'ils ont perdu le ſens.*

2. *L'Abbé Roſpiglioſi, neveu du pape, a fait des preſens magnifiques. Jamais pape n'a tant depensé pour ſes parens que celuy-cy. L'Abbé Le Tellier eſt fort conſideré à Rome, d'où il reviendra au mois de Mars.*

3. THERE has been ſo great a hurricane in Auguſt laſt about our *Leeward-Iſlands*, *Mevis*, St. *Chriſtophers*, *&c.* that it hath ruined all the houſes both of our and the French plantations, and the caſtles alſo, and likewiſe deſtroyed all the ſugar-works and the proviſions on the ground, inſomuch that our people have ſent to the governor of *Barbados*, that, unleſs they be forthwith ſupplied with victuals, they muſt, if they will not ſtarve, abandon the iſlands. I have no more time left me, than to ſay, what really I am,

SIR,

your faithful humble ſervant,

H. OLDENBURG.

London, Dec. 17, 1667.

SIR,

THE particulars ſent from *Dantzick* are ſo various and large, that I know not where to begin, nor how to redeem ſo much time, as to tranſcribe them. I think, you will be much better pleaſed, to have them read to you, when you ſhall be returned to *London*; and then you will alſo find with more ſatisfaction divers things, wherein you are deſervedly mentioned with honour, tranſmitted from the ſame parts. I am ſure, no man imagines, what ſtore of papers and writings paſs to and from me in a week, from time to time; which I muſt rid myſelf of, without any aſſiſtance. I have no leſs at preſent, than thirty correſpondents, partly domeſtick, partly foreign. Many of them I am not only to write to, but alſo to do buſineſs for; which requires much time to enquire after ſuch particulars, and diſpatch ſuch buſineſſes as they deſire, if I mean to be gratified reciprocally in ſuch things, as I beſpeak of them. Beſides my conſtant attendance on the meetings of the Society and Council, and preſerving what is ſaid and done there, and giving order to have all regiſtred, and reviewing all the entries; ſoliciting alſo the performances of the manifold taſks, recommended and undertaken by the members of the Society; and diſtributing and ſending abroad ſuch directions and enquiries, as are thought conducive to advance our deſign, *&c.* I confeſs, I extend my patience as far as I can; but I am afraid, I have ſtretched it ſo far already, that it will break, unleſs ſomething be done to fortify it in ſome meaſure, which I find not, that any of thoſe, who are upon the place, and cannot but ſee my daily labours and toil, are in the leaſt ſolicitous of; though ſome of them are forced to acknowledge, even in my hearing, that no man in *England* would do, what I do, upon the terms I go away with.

SIR, pardon me for this ſally; I am confident you do not much blame me for this complaint, which I dare lodge in the boſom of ſo good and noble a friend, that in great meaſure knows my work and my condition, and, upon occaſion, repreſents it too. I have ſome ground to believe, that there are perſons, who think, the Tranſactions bring me in a ſufficient revenue. But I will make it out to any man, that I never received above forty pounds a year upon their account (and

that is little more than my houſe-rent.) And now by a new agreement, I have been obliged to make, I ſhall not bring it to above thirty-ſix pounds a year at moſt. How ſtrangely therefore I muſt needs ſhift for my ſubſiſtence, and with what diſtraction I muſt perform my tedious work, let any ſober man judge.

SIR, I ſhall not fail, God permitting, to convey the *Logica Hamburgenſis* to you, as you have directed; and you will find ſome books taken notice of in the Tranſactions of this month (whereof ſome are to be ſent away this day to *Oxford*) which I believe you have not met with before, except it be, perhaps, the *Hiſtoriæ Litterariæ Prodromus Lambecii*; which, I hear, ſome few perſons have ſeen ere this. I ſhall be very glad to ſee, what you are pleaſed to intend me farther, in reference to the queries about ſhining wood, which I received on Wedneſday laſt, and was much pleaſed with ſome of your experiments upon that ſubject, which could not be read the week before, were read at our laſt meeting, and gave great ſatisfaction, with expreſs order, to redouble to you the ſolemn thanks of the company; who have not yet made any trials of that kind, having of late been engaged in abundance of other things, brought before them from within and without, and in the experiments of transfuſion, which on Thurſday laſt was repeated upon the ſame man, in the preſence of a ſtrange crowd, both of foreigners and domeſticks; the recipient enduring the operation with as little concern, as before; and finding himſelf at preſent, very well in health, though ſtocked with a far greater quantity this time, than before; which made him a day or two after the operation a little feveriſh; though that may be juſtly imputed to his diſordering himſelf by intemperate drinking of wine.

I HOPE, I ſhall not omit to ſuggeſt, what is neceſſary for the clearing thoſe circumſtances in your experiments of light, you are concerned about; yet without giving any hint of that particular, which relateth to the making of ſome of thoſe experiments in ſealed receivers.

FROM *Caën* I lately received the following account about the diſſection of an owl's eye.

En faiſant la diſſection de l'oeil d'un hibou, on a remarqué, que la partie lucide de la cornée eſt fort prominente; qu' en la regardant de travers, on voit une partie du Chriſtalline; qu'elle eſt couverte obliquement de l'adnata, qui s'avance plus ſur la cornée vers l'angle interieure que vers l'exterieure; que cette adnata eſt fort dure & preſque de ſubſtance cornée, comme à tous les autres oiſeaux, autour de l'oeil: mais elle eſt fort molaſſe & tranſparente au fonds de l'oeil, c'eſt à dire, dans la partie diametralement oppoſée à la partie lucide. Elle eſt tranſparente à tel point, que l'ayant nottoyée des chairs des muſcles, on y voit les eſpeces renverſées ſe prendre fort diſtinctement; mais cela luy eſt commun avec les yeux de preſque tous les oiſeaux, & de pluſieurs autres animaux. Ce qu'il y a icy de particulier, c'eſt cette prominence extraordinaire de la partie anterieure de la cornee; l'humeur aqueuſe eſt en aſſez grande quantité & fort gluante, & l'humeur vitrée en petite quantité & fort fluide, contre l'ordinaire des autres animaux, dont l'humeur aqueuſe eſt en mediocre quantité & fluide comme de l'eau, & l'humeur vitree eſt en abondance & fort conſiſtente. L'humeur chriſtalline eſt preſque ſpherique, les deux ſegmens de globe, qui le compoſent, ſont egaux contre l'ordinaire des autres animaux, dont le chriſtallin eſt plus plat à la partie anterieure & plus boſſu dans la poſterieure. Son iris ne ſe reſſerre point à la maniere des autres animaux, & cela eſtant, il ne faut pas s'eſtonner, que le grand jour, dont nous nous parens en reſſerrant l'iris de noſtre oeil, bleſſe le chahuant; joint que la groſſeur de ſon chriſtallin fait une trop forte refraction à cauſe de ſa figure.

I MUST ſtop here, adding only, that I am,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

P. S. SIR, I had almoſt forgot to deſire you, that you would pleaſe, timely to give me directions about the title to your Experiments concerning light and air; and whether I am to expect any additions to them: for I intend, God permitting, to print the Tranſactions for the next month ſo early, as that they may, if poſſible, be abroad the firſt week in January.

SIR, I entreat you to oblige me, by preſenting my humble ſervice to Dr. *Wallis*, whoſe excuſe I beg, for not doing it myſelf by an anſwer to his laſt; which I hope to do next week, God willing. I know, Sir, you will communicate to him the philoſophical part of this paper, if you think fit.

London, Dec. 24, 1667.

SIR,

THE favour of your laſt letter, and your excellent both poſtſcript and appendix, came yeſternight to my hands in one hour. Now I have received ſo full inſtructions concerning them, I ſhall haſten them, God willing, to be publiſhed, as ſoon as thoſe feſtivals, ſo much generally abuſed to idleneſs and irreligion, are paſt; expecting mean while that experiment you intimate to have made for confirmation of the laſt in the poſtſcript.

SIR, ſince you have done me the honour of addreſſing theſe noble experiments to me, ſome words of your papers being alſo directed to a particular perſon more than once, I think, you will permit me to fill up the two blanks thus:

MADE by the honourable *Robert Boyle*, and by him addreſſed to the publiſher; and further communicated to the Royal Society, before whom they were read at their publick meeting December 5. with much applauſe.

THE Society ſhall not meet till January 2. at which time, I believe, they will receive a good account of a pretty hermaphrodite, now in

in *London*, which was lately viſited by Dr. *Allen* and myſelf, and viewed at our leiſure, having the parts of both ſexes very diſtinct and perfect enough. I think, I ſhall be deſired to publiſh it, which if I do, I ſhall do in Latin.

I RECEIVED in my laſt letter from *Paris* a ſhort relation of a mare, that caſt a horſe-colt, and two hours after, a mule, doubtleſs by a ſuperfœtation. The ſame letter tells me poſitively, that the Florentine experiments are now printed, but not yet ſent abroad: but that thoſe two conſiderable books, *De vi Percuſſionis*, of *Borelli* the Italian, and *De Myologia*, of *Steno*, are on the way for me, by the ſingular favour of Monſieur *Auzout*, (to whom they were ſent by P. *Leopold* himſelf, who ſent two couples more of them to two other philoſophers at *Paris*, no more being come out of *Italy* as yet, if I am not miſinformed) parted with to ſatisfy my curioſity, which, it ſeems, he found by ſeveral of my letters lately written to my ordinary correſpondent at *Paris*.

IF thoſe Pariſians miſrelate not, there hath been freſhly made in that town an experiment of transfuſion on a madman, with a ſurpriſing ſucceſs; which I ſhall give you in my author's own words, *viz.*

Nous avons fait la transfuſion ces jours paſſez ſur un fol de la derniere extravagance, qui couroit les ruës tout nud, et qui faiſoit compaſſion à tout le monde. Nous luy transfuſe du ſang de veau par 2 fois differentes, et apres la derniere, qui fut plus ample, et en preſence de 8 medecins capables, il fit paroitre quelques emotions, qui furent ſuivies d'un profond aſſoupiſſement pendant toute la nuit, au revueil duquel il donna tout teſmoignage d'un ſens fort raſſis, et comme il apprit, que nous eſtions au temps du jubilé, il demanda à ſe confeſſer, et ſon confeſſeur le trouva ſi raiſonnable et ſi exact en toutes choſes, qu'il jugea à propos de la laiſſer approcher de la communion. Nous ne ſcavons pas encore, quel en ſera le ſucces. Je vous en apprenderay le detail au plus-toſt.

THIS is confirmed from another hand of the ſame place, with very little variation: which, together with an account of the preſent condition of the former patients of this operation, I ſhall be obliged to inſert into the next Tranſactions; which, I think, will be all I ſhall have room for that month; your papers about Light being ſo rich and ample, that they will abundantly ſtore me for three ſheets in print. I hope, I ſhall take that care of ordering all what concerns the right publiſhing of them, that you will find no fault with me in that particular.

MONSIEUR *de Launay* hath tranſmitted to me his printed Eſſay *du Lieu, de Temps, et du Viude*, wherein I find great acuteneſs and much learning, clearing up thoſe three particulars (ſo nice and perplexed) with more ſatisfaction to me, than I have met with elſewhere; and falling in cloſe, yet civilly enough, with *Des Cartes*, and diſcuſſing his notion *de corpore & vacuo* thoroughly, if I much miſtake not.

I AM like to enter into a correſpondence with the excellent *Carcavy*, a great mathematician, and one that knows moſt of the intelligent and curious men in the world, his French majeſty's bibliothecarius, and the chief director of the new experimental academy at *Paris*. He deſires of me, for the compleating of the library he hath charge of, to ſend him a catalogue of all the conſiderable books, whether hiſtorical, political, philoſophical, eccleſiaſtical, that have been printed in England theſe laſt dozen years, whether in Engliſh or Latin. I muſt confeſs, that I can meet with none of our ſtationers here, that can give me a ſatisfactory account hereof. Methinks, the Oxonian library receives an exemplar of every good book, that is printed in *England*. If the ſub-bibliothecarius could be prevailed with to cauſe ſuch a catalogue of the twelve laſt years to be made, I know it would be a kindneſs to that gentleman, and provoke him to good communications.

To annex ſome ſtate news, my friend at *Paris* writeth thus:

1. *On mande, que la reyne d'Eſpagne a accepté la mediation du pape; qu'elle agree la ville d'Aix la Chapelle, où les plenipotentiaires ſe doivent trouver. Elle a nommé Caſtel-Rodrigo pour s'y trouver de ſa part. On eſcrit de Rome, que les Eſpagnols faiſoient ſemblant de ne vouloir pas la paix, quoy qu'en effet ils la ſouhaitent.*

2. *Les Eſtats de Holland ont preſté le ſerment pour la ſuppreſſion de gauverneur de province.*

3. *L'electeur de Baviere ſuivra les ſentimens de l'empire, & les Suedois auſſi apparemment. On n'eſt pas trop ſatisfait des ducs de Lunenbourg.*

4. *On ne preſſe pas encore les levées icy; neantmoins on ſe diſpoſe à tout evenement. Le roy eſt en eſtat de reſiſter à tous les ennemis, qu'on luy ſuſcitera. Les Hollandois ne ſe declarent point contre luy. Au contraire, ils ſont d'advis d'obliger les Eſpagnols de luy donner ſatisfaction. Nous ſcaurons ce qui arrivera de toutes ces negociations devant la fin de Mars.*

5. *Le frere du roy de Portugal a desja commencé d'agir. La reyne eſt encore dans le couvent. On la marie avec ce nouveau roy ou regent.*

I MUST end with the paper, after I ſhall have told you, that Dr. *Beale* writes me word, that Mr. *Baxter* inveighs in his book, written to aſſert the reaſons of the Chriſtian religion, againſt the corpuſcularian (called by him the ſomatical) philoſophy, and traduces it, as if it ſupplanted our future eſtate. This our good friend, who preſents his humble ſervice to you, would fain have obviated and rightly ſtated, to prevent ill effects, like to follow the popular diſcourſing of a popular man. I am,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

SIR,

I MUST beg your excuſe for not ſeeing Dr. *Sydenham*, who hath been the only man, that I hear of, who, when I was ſhut up, thought fit (God knows without cauſe) to

rail againſt me, and that was ſuch a coward, as afterwards to diſown it, though undeniable. I confeſs, that with ſo mean and unmoral a ſpirit I cannot well aſſociate.

London, Dec. 31, 1667.

SIR,

I CAN aſſure you of the validity of my warrant for what I ſaid formerly concerning the title of your experiments; though the genius and cuſtom of the Society, touching the making publick their judgment about any matter, and their nicety in it, may be a ſecond conſideration.

I HAVE received your poſtſcript, and the concluſion of it. I find it will take up three full printed ſheets, if I publiſh all at once, what you have been pleaſed to communicate; I would propoſe to refer the agreement and diſagreement between a live coal and ſhining wood, till the next month; becauſe I have been often told, that variety of arguments is expected in theſe philoſophical Occurrences. I confeſs, I think it long to ſee thoſe aerial experiments you mention as diſcovering more obſervables in that element. I do religiouſly obſerve your injunctions about the precautioned ſealed paper you lately ſent me. If I hear by your next, that you intend to ſtay yet any time at *Oxford*, I ſhall ſend you monſieur *De Launay*'s eſſay of Place, Time, and Vacuum.

THE intimation you give me about taking notice in the Latiniſed Tranſactions of ſome particulars concerning ſome of your books, I ſhall take care of, God willing.

I FIND by the laſt Pariſian letters, which I received ſince my laſt to you, that that madman is relapſed, and piſſeth blood, ſuppoſed to proceed from too large a transfuſion.

I AM in extraordinary haſt at this time, which maketh me annex only the particulars of the ſtate-news, that came by the laſt poſt, *viz.*

1. *Meſſieurs les eſtats doivent envoyer monſieur Van Beuning en France en qualité d'ambaſſadeur extraordinaire, il demandera une ſuſpenſion juſques à ce que la paix ſoit faite, ce qu'on luy refuſera apparemment. L'electeur de Brandebourg envoye trois de ſes miniſtres, qui ne feront pas grand choſe.*

2. *Il y a bien de l'apparence, que la paix ne ſe fera pas. La revolution arrivée en Portugal eſt tout à fait en noſtre faveur. On parle qu' à Naples il y a des meſcontentemens. Nous ſerons aſſez heureux pour en voir par tout, & cependant on avancera en Flanders, & petit à petit on eſtendra bien loin les frontiers du royaume. Il n'y a perſonne de s'oppoſer à nos forces, qui ſeront conſidérables, quoy qu'on puiſſe dire.*

3. *Le conſeil d'Eſpagne n'eſt pas bien uni, & il ſemble de la maniere, dont on agit en ce païs là, que les Eſpagnols ayent perdu le ſens. La France profitera de tous ces avantages là, & rendra inutiles tous les deſſeins de ſes ennemis. Vous verrez à la campagne, qui vient, la verité de ce que je vous predis.*

SIR, I humbly thank you for your favour in inquiring after the books for monſieur *Carcavy*. I have got catalogues for ſome few years of thoſe twelve, that are deſired, *viz.* for 57. 58. 63. Thoſe catalogues, that were kept in the Stationers-Hall, they tell me, are burned. I muſt very abruptly ſubſcribe, what I really am,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

SIR, much happineſs to you with this new year, and to all our common friends at *Oxford*.

London, Jan. 7, 1667-8.

SIR,

I CANNOT but humbly thank you for returning to me with ſo much ſpeed my late letter, together with the emendations. I find ſince, to my trouble, that theſe holidays are ſo much turned into drinking-days, that this month's Tranſactions will come out, at leaſt one week later, than was intended, when I gave you the trouble of the forementioned letter. I received, four or five days ago, a book, made by *Van Helmont* (which, I doubt, will prove no great commendation to it) entitled, *Alphabetum Naturæ*, in the German tongue, though it be alſo printed in Latin; of which edition an exemplar, formerly ſent over for me, miſcarried at ſea, and are no more copies to be had in *Holland* at preſent, though I hope to procure ſome from *Germany* in time, if they be thought worth ſending for. It pretends to make out, that the very figures of the Hebrew alphabet do repreſent the motions and configurations of the mouth and tongue, *&c.* requiſite to frame ſuch ſounds, as make thoſe letters; attributing more therein to the characters of the Hebrew alphabet, than to thoſe of any other. By ſchemes it exhibits the ſeveral poſtures and figures of the tongue, as paint the very letters. And there is alledged an example of a quite deaf and dumb man, who by theſe principles was made to anſwer to every thing, that was ſlowly ſpoken to him, in the ſpace of three weeks. Of which, and the other particulars contained in this book, I am ſolicited to give a full account in the Tranſactions, now a printing.

MR. *Hook* brought in lately, at the Society's meeting, a contrivance for diſcovering the various preſſure of the air at ſea, thereby to foretel approaching ſtorms. If he did not acquaint you with it before this, I think I may take the liberty to do it, if you ſhall command it, the thing being made publick in ſo publick a place.

I HEAR from *Paris*, that monſieur *Steno* hath written a treatiſe *De Cerebro*, as Dr. *Willis* hath done, and that it will be printed ere long.

THE philoſophers at *Caen* find, that their ſalt water, being made ſweet with little charge and

and in great quantities, hath *quelque gouſt de fumier*, which yet they hope to correct, intending thereupon to give it to beaſts firſt, to try its wholeſomneſs, before they give it to men.

THE madman, who found ſo notable a change by the transfuſion, I think, I told you of, to have been lately experimented at *Paris*, is ſomewhat relapſed, and piſſeth blood; perhaps from too plentiful a tranſmiſſion. It muſt be known, both how much blood is transfuſed, and how much is fit to be tranſfuſed, to go ſure.

STATE news is this: The French king hath ſent to the pope his laſt reſolutions of what he will agree to in the treaty. The Swediſh ambaſſador, when come, will revive the Dutch treaty here, and probably help to bring it to a good iſſue. The queen of Portugal hath got from the quondam king there a ſworn declaration, that he hath not performed the part of a huſband to her; and conſequently is like to marry the brother.

WHEN I ſee Mr. *Crook*, I hope I ſhall remember the commiſſion you have given me to him. I ſhall preſume to give you ſhortly notice of the time and manner of the intended Latin edition of the Tranſactions. I am very glad to hear, I ſhall quickly receive the firſt part of the papers ſealed. By the end of this week you are like to receive the French tract of *Launay* from,

SIR,

your very humble,

and faithful ſervant,

H. O.

I PRAY, Sir, pardon this haſty ſcribble.

I WAS lately deſired, by a very ingenious French proteſtant at *Paris*, to inform myſelf, *s'il y a dans la bibliotheque d'Oxford quelque traité des Grecs modernes, qui prouve, que les Grecs ne croyent point la tranſubſtantiation.*

THEY ſay, it is true enough, that the Greeks do not believe it, but it is difficult, to juſtify it. And therefore they would fain have proofs of this truth, by books written theſe laſt fifty years. I beſeech you, Sir, as you have opportunity, be pleaſed to enquire after this, and let me alſo intreat Dr. *Wallis* to join with you in the enquiry.

Ways of diſcovering the various preſſure of the air at ſea, by Mr. Hook.

"CONSIDERING with myſelf, of how "great uſe the being able to diſcover the va- "rious preſſure of the air at ſea might be, "for the foretelling the alterations of wea- "ther, to provide againſt approaching ſtorms, "I was very deſirous to find ſome contrivance "for its diſcovery, which might be eaſily "made uſe of at ſea. And finding it very "difficult to make uſe of the common or "wheel-barometer with mercury, by reaſon "of the ſhaking of the ſhip, which would "cauſe a very great dancing and vibration of "the ſurface of the mercury, I contrived "ſeveral ways for the preventing that incon- "venience in good part. Now though I "found, that very much of that might be "taken off, by having an exceeding ſmall "hole at the open end of the tube, to admit "the air, whereby the air on the top of the "mercury was as it were impriſoned, or "(which is much better) by having a ſmall "ſtop-cock placed juſt in the bending of the "two pipes, ſo as after they have been filled "and inverted, according to the uſual man- "ner, the key of the ſtop-cock may be juſt "ſo far turned, as to leave the leaſt imagina- "ble paſſage for the mercury between the "two ſtems; yet the inconvenience of the "vibration was not wholly removed, though "I believe, by this laſt expedient, a wheel- "barometer may be very well uſed at ſea by "a judicious man; and therefore for ſuch "a perſon I think it preferable before any "other way whatſoever. But becauſe every "one is not ſo well able to give an eſtimate "of the middle of ſuch kind of vibration, "I bethought myſelf of ſome other ways of "diſcovering the preſſure of the air, wherein "no ſuch motion is to be feared. And for "this, I think, nothing can be better than a "weather-glaſs, made with pure air and mer- "cury, wherein the mercury is left open to "the preſſure of the air, and ſo becomes "agitated by a double principle of motion, "heat and the preſſure of the air. In this "inſtrument I make uſe of cleanſed mercury, "1. that it may not by the great heats of "the air under the torrid zone be evaporated "and diminiſhed; 2. that it may not be "frozen by the colds of the frigid zone; and "3. that the included air may not be aug- "mented by any ſteams, that may ariſe from "almoſt any other ſubjacent liquor. For "this I take to be very ſecure from any mu- "tation of the air, as to heat and cold. To "diſtinguiſh therefore, what part of its mo- "tion is aſcribable to the heat of the air, I "would have another thermometer made with "ſpirit of wine, and ſealed, as I have elſe- "where deſcribed. Now both theſe thermo- "meters ought to be graduated together in a "ſtove, or ſome ſuch place, at once, where- "by the correſponding degrees of expanſion, "ariſing from heat and cold, may be viſible. "And if, by making obſervations with them "at land, the diſcrepancy of them to one "another be compared to the mercurial "ſtandard, it will be very eaſy to calculate "a table of differences, which ſhall exhibit "all the various degrees of preſſure anſwer- "ing to all the various degrees of heat and "cold. And ſo, only by the help of two "ſuch weather-glaſſes, all the various preſſure "of the air may be very practicably diſ- "covered at ſea, and conſequently the mu- "tations of the weather may perhaps, in "great meaſure, be timely enough diſcovered, "by the inquiſitive and diligent mariner."

So far he. The Society is deſirous, that all the objections, that may lie againſt this contrivance,

contrivance, may be brought in, to diſcern the better, whether and how far it will do. I doubt not, Sir, but you, Dr. *Wallis*, and Dr. *Wren*, will thoroughly examine it, as ſome are doing here, and impart unto us your thoughts concerning it, as ſoon as you can. For, if it ſhall be approved of, we intend to furniſh immediately ſome ſhips with it, that are now going out.

London, Jan. 14, 1667.

SIR,

I HOPE, when you have received a good information about the Greek books, (for which I ſhould eſteem Dr. *Barlow*'s account chiefly) you will not delay the favour of tranſmitting it to me. Mr. *Hook*'s way of meaſuring the preſſure at ſea you have here annexed; and he knows of the order given by you to M. *Herringman*, for a book of yours to be delivered him. I have not now any leiſure to look into your book of Cold, where, if I remember well, you have mentioned, if not deſcribed, a way of making baroſcopes ſo, as that they may be ſafely tranſported from place to place; but ſince you intimate, you would have made no mention of it, I ſhall be altogether ſilent.

DR. *Willis* hath examined the powders come from *Briſtol*, and ſaith, that that powder, which is to make the Spa water, is either vitriolum Martis at the beſt, or rather only a common Engliſh coperas dried and powdered. For the other powders, each of them being a ſeveral calx (he ſaith) of mineral water evaporated, there is no uſe of them, nor any thing worth enquiry to be inſiſted on about any of them.

I SOMEWHAT ſuſpect this judgment, for a reaſon you may eaſily imagine. Dr. *Merret* is ſomewhat more particular concerning the ſame, nor doth he undervalue them. He gave it in writing, and produced it before the Society, that num. 1. entitled, *Simple Extract of St.* Vincent's *Water*, is a creta with ſome vitriolate juice mixed with it. Num. 2. entitled, *Compound Extract*, hath vitriol in greater quantity apparently in it. Num. 3. is vitriolate too. Num. 4. ſaid to be made of ſteel, is nothing but a preparation of common vitriol, which by another preparation may be made only diuretick as other medicinal waters are; and that he hath found by frequent experiments, that *Tunbridge* and other purging waters are purely vitriolate.

THIS puts me in mind of a paſſage, contained among the particulars lately ſent from *Dantzick* by another conſul of that town, called *Michael Behm*, who ſeems to be a philoſopher as well as a ſtates-man, and one alſo, that hath no ordinary eſteem of the Engliſh virtuoſi, and particularly of yourſelf. This gentleman, after he had given a ſingular good character of your books *De Fluiditate*, *&c.* and *De Coloribus*, goes on thus:

Utinam illuſtris vir (meaning you) *de natura ſalium experimenta ſua ampliora edere dignaretur, quomodo alcalia ſive lixivialia utpote fixa ab aliis acidis auſteriſque non minus ferè fixis diſcrepent, et utraque à volatilibus atque aliis ſpeciebus ſalium ſatis explicatis, atque craſi nomineque diſtinctis. Nam inter volatilia differre videmus ſal urinoſum à ſale, quod ineſt ſpiritui vini aliiſque inflammabilibus; quia commixta coagulantur et novam indolem acquirunt. Taceo mixturas liquoris ex nitro fixo cum ejuſdem ſpiritu acido, de quibus bene egit Dn. Boyle aliique. Magnam ſpem habeo inveniendi liquorem, qui veſicæ injectus blandè comminuat calculos, aliaſque mixturas, quæ in ventriculo et meſenterio noxias atque varias viſciditates (quas tartaro immeritò adſcribunt plurimi) præcaveant vel attenuent. Utinam Dn. Gliſſon, Wharton aliique ex anatomicis chymiciſque experimentis explicare vellent lymphæ, ſanguinis ſerique ejus degenerationes, et conglutinationis atque corruptionis modos et cauſas. Nuper ſerum ex ſanguine brutorum examinavi, et levi calore coagulari vidi, ferè inſtar albuminis ovi; potiſſimum addito acido indurabatur; ſed ab admixto ſpiritu vini ſerum tenebatur diu liquidum, magis tamen ab alcalibus: propediem accuratiora tentabo. Faciebam id, dum à podagra vexabar, quæ me à curis politicis invitum adegit hactenus ad hæc et talia medicinalia. Notavi ſanè morbos podagricos oriri, ubi urinoſa putrilago non ſeparatur per renes aut ſudores à maſſa ſanguinea, ſed cum ea diſtribuitur, et circa juncturas in frigidioribus ligamentis hæret; ubi propter ſalis acredinem dolores acriores, difficiles tamen, vel propter glutinoſitatem tophos aut rigores junctuarum efficit. Utinam hujus mali cauſas atque medelas ſublimia Anglorum ingenia penitius inveſtigare et orbi communicare vellent, ne inter medicos amplius incurabile cenſeatur. Idipſum initio me valdè fecit anxium, præſertim cum diligenter notarem, apud ægros nil prodeſſe purgantia et ſanguinis miſſiones, parùm ſudores et cauteria; obeſſe emplaſtra oleoſa, et refrigentia omnia: imò et ſpir. vini et ſalis armoniaci non ſatis elicere aut diſcutere totam materiam. Thermas* (this is the thing I chiefly intend this tranſcript for) *valdè ſalubres eſſe, norunt omnes, et ipſe expertus ſum, præſertim quæ urinam provocant. Sed quia non ubique extant thermæ, præbuit mihi curioſitas liquorem, qui odore, ſapore, virtute, ſatis exactè emulatur thermas; ita, membra ægra, reliquum verò corpus ſimplici calida balneando, magnum levamen ſentio. Porrò expertus ſum proprio auſu inſignem medelam per pilulas, quæ urinam promovent, ſanguinem depurant, fluidioremque reddunt, calculi materiam atque ſcorbuticas in meſenterio viſciditates referant, abſque alvi turbatione. Verùm per veſicatoria (diſſuadentibus licet medicis) dolenti parti adhibita, optimam, promptam, atque tutam hactenus per aliquot annos mihi aliiſque amicis inveni medelam; quamvis eam aliis, ad fiſtuloſa ulcera pronis, non ſuadeam. Utinam alii ſuas quoque medelas candidè efferrent; non enim omnia proſunt omnibus.*

THERE are ſeveral other not inconſiderable particulars both in this, and in another letter of the ſame conſul, which I have not now time to tranſcribe, and which may perhaps be of the ingredients in a number of the following Tranſactions.

I SENT

I SENT on Saturday laſt by poſt the French printed paper, it being not bulky, and hope, it is well arrived. I wiſh your amanuenſis did not diſappoint you ſo often. Since Mr. *Davis* intends to print thoſe two books of yours mentioned in your letter, I am ready to furniſh him with the verſion of the Paradoxes, leaving it to you, what conſideration he is to allow for it, it having required no ſmall pains and time to perform it. I purpoſe, God willing, to read it over as ſoon as poſſibly I can; which, I hope, I ſhall have done within this fortnight; at or about the end of which I ſhall be able to ſend it you, if ordered to do ſo.

I HAD lately from Mr. *Colepreſſe* a letter with ſome of his own obſervations concerning the tides, anſwerable to the queries printed in the Tranſactions; in which hereafter thoſe anſwers of his may likewiſe be publiſhed. He acknowledges in the ſame letter the receipt of your book, and I believe he hath alſo thanked you for it ere this.

THERE are no French letters come to me ſince my laſt, nor any others from abroad. We diſcourſe of ſetting out a fleet in the ſpring; I hope it will be in conjunction with the Dutch, to repreſs the conquering neighbour; which will ſoon appear, when the Swediſh embaſſador ſhall be arrived here. Sir, I cannot conclude this, without acquainting you of the deſign of the Society's council, whereof you are a member, of building a college, as one of the moſt probable means of their eſtabliſhment. They did, on Saturday laſt, conſider of it in a full council, where *H. Howard* of *Norfolk* was alſo preſent (who intends to continue his nobleneſs, either by contributing to this work a good ſum of money, or by giving us ground about *Arundel* houſe to build upon) and proceeded ſo far as to view a draught, and to ſelect out of the Society's liſt ſuch perſons, as they thought both willing and able for ſuch contributions: and to carry it on the more effectually, they appointed a committee of beggars (as they were pleaſed to term it merrily) or ſolicitors, to ſpeak to ſuch as were called out for that purpoſe, and to recommend this work to their liberality. Our preſident biſhop of *Saliſbury*, Mr. *Howard*, Dr. *Wilkins*, and myſelf, are the principal beggars; we want Sir *R. Moray* exceedingly in this employment. Thoſe, that came to my ſhare, are ſet down in the encloſed liſt; and I was particularly deſired to acquaint you with this intention, and alſo Sir *R. Moray*, to engage him to beg in *Scotland* among the noblemen there, that are of the Society, on our behalf. I believe, Sir, you will not be diſpleaſed, if I am open and particular to you in this buſineſs; which I think myſelf obliged to be, as tending to your better direction and information. They gueſs there will be four claſſes of contributions: ſome of an 100 *l.* ſome of 60 or 50, ſome of 40, ſome of 20. Our preſident hath already declared for 100; and I think, the biſhop of *Saliſbury* for the like ſum. Dr. *Wilkins* for 50, Mr. *Hayes* for 40, Sir *Phil. Carteret* for 50, and if there be occaſion, for more. We begin with the council, and proceed to the Society; that, when we go on to beg of others not of our body, they may not object, we would load others, and draw our own necks out of the yoke. The council, when they ran over the liſt of the Society, thought you, Sir, the fitteſt perſon to beſpeak my lord *Clifford*'s generoſity in this matter, thinking it ſuperfluous to invite yourſelf otherwiſe, than by a bare intimation. I am confident, you take in good part both the council's and my freedom in this diſcourſe, which ſtops my pen of ſaying more by way of excuſe of it. I muſt now paſs to make a tranſcript of Mr. *Hook*'s paper, which was promiſed you in the beginning of this letter, by,

SIR,

your very humble,
and faithful ſervant,
H. OLDENBURG.

London, Jan. 18, 1667.

SIR,

I AM almoſt altogether perſuaded, that upon a mature conſideration of the importance of building a college to eſtabliſh the Society, you will not at all heſitate in giving your approbation and concurrence thereto. We had, on Saturday laſt, at the meeting of the council, a draught of the ſtructure before us, which was ſcanned ſufficiently, Mr. *Howard* being there alſo, and giving no ſmall proof of his underſtanding and ſkill in that art, as well as of his frankneſs and generoſity in giving the foundation, and forwarding the execution of the work. I think, we ſhall at our next council, which is ſummoned to meet on Thurſday next in the evening, begin to make ſubſcriptions in ſuch a form, as may be obligatory in law, and yet not ſevere in the expreſſion. My lord *Angleſey*, having the thing occaſionally mentioned to him by me, ſhewed ſo much inclination to it, that he is like to be received into the Society, and to be both a contributor and ſollicitor for this noble work. Sir, my opinion is, ſince you are pleaſed to demand it, that in caſe you think not yet fit to come to *London*, you may declare in a note to me the ſum, you intend to caſt in, directing me to ſignify it to the council, and giving order, where the Society's treaſurer ſhall receive it.

CONCERNING the proviſion made by the council to ſecure men's philoſophical proprieties, they have ordered, that if any thing of that nature be brought in and deſired to be lodged with the Society, in caſe the authors be not of their body, they ſhould be obliged to ſhew it firſt to the preſident (for fear of lodging unknownly ballads and buffooneries, in theſe ſcoffing times) and that then it ſhould be ſealed up, both by the ſmaller ſeal of the Society, and the ſeal of the propoſer; but if the authors were of the Society, that then they

ſhould not be obliged to ſhew it firſt to the preſident, but only to declare the general head of the matter to be laid up, and that then it ſhould be ſealed up, as mentioned before.

I DOUBT not, when that other critick ſhall have found any thing conſiderable about the *Greeks* faith in the doctrine of the ſacrament, you will take care, to ſee it ſpeedily communicated to me. As I was writing this, there came to viſit me the rabbi *Abendana*, whoſe brother is now at *Oxford*. He mentioned, what had been done in his buſineſs of vending ſome Hebrew manuſcripts, and that it was likely, ſome would be bought at *Oxford*, and particularly, that you had expreſſed an intention to buy ſome of them for yourſelf. I told him, that I was perſuaded, you would aſſiſt Dr. *Barlow* in furthering this matter, as much as you could; and he deſiring me, that I would recommend it to your particular care, I promiſed him, to do in it, what you ſee here, I do; intreating you withal, to preſent, upon occaſion, my humble ſervice to Dr. *Barlow*, and to give him many thanks from me, for conſidering my note, I ſent to him by theſe Hebrews, when he was at *London*, for recommending their deſires to him, I being then ſo unfortunate, that I always miſſed of Dr. *Barlow*, when I was to wait on him at his lodgings in *Holborn*.

I AM ſorry, I find nothing in your letter declared concerning Mr. *Hook*'s way of examining the preſſure of the air at ſea. It is a thing, that ſhould be well and ſpeedily conſidered, that now the ſeaſon is come of ſhips going into all parts, it might be recommended to ſeveral careful maſters of ſhips, for their obſervation. There are twelve great ſhips going for the *Eaſt-Indies*, whereof ſeven or eight are ready to ſet ſail by the firſt fair wind, the reſt to follow ſoon after. Here is a good opportunity for this particular, as well as for other inquiries, we have lodged with ſome of them, and intend to do, God willing, with the reſt.

I AM very ſorry, we muſt be ſo long deprived of your company, and I ſtretch my patience ſo far in ſtaying for the particular deſcription of the way of making experiments with ſealed receivers, and for the ſight of the performance of the trials themſelves.

ON Thurſday laſt Dr. *Lower* produced, by order, ſome horſes eyes, and ſhewed the company the cauſe of their frequent blindneſs, which is ſuch, that they can ſee nothing in the day time, but ſee very well in the dark, ſo as that they ſtumble and fall, when they travel by day, but go well by night. He ſaid, there was a ſpongy excreſcence growing in horſes out of the uvea, which did cover the whole pupil, when contracted by the daylight; which was removed by the opening and enlarging of the pupil in the dark.

WE had alſo the view of four or five dozen particular ſorts of mineral, ſent to me for the Society's repoſitory by Mr. *Colepreſſe*, which pleaſed very well; among which there was a kind of earth, pretended to be a *terra ſigillata*, and an iron oar mixed with another matter, which, though ſo mixed, was yet ſenſible enough of the loadſtone. Sir *William Strode*'s ſon is here, and, I believe, another ſuch collection for you, if you could but come to receive it.

THE commiſſioners for accounts have ſent about their letters to the treaſurers and receivers, to bring in an account of monies received, *&c.* The parliament-men begin to flock hither again for February 6. and to talk already of what may be the fitteſt way of raiſing more money, for the next ſummer's fleet, which, it is thought, will be rather done by a general exciſe upon commodities of conſumption, limited to two or three years, than to a new land-tax.

THE French ſhew, by their laſt letters, that they are ſurpriſed at our league with the Dutch, uſing this expreſſion: *Peu de gens avoient crû, que les choſes en duſſent venir là.* Their king is certainly gone, with a good army, to the *Franche Compté*, and, ſome ſay, already ſat down before *Dole*, to take in thoſe poſts before the imperial forces can paſs into *Burgundy*, and to prevent his being attacked in thoſe parts.

I HEAR, the phrenetick man, that received the calves blood into him, is now very well, and that the experiment of it is printed by M. *Denys*, from whom I expect a copy of it every day.

WHEN they opened at *Vienna* the little archduke, that was born and died lately, there was found in his lungs three ſtones, and much ſerum in his brain.

AT *Paris* they have found four breaſts on a woman, that died in one of their hoſpitals.

I AM certainly promiſed a copy of the Florentine experiments, now abroad; and I expect every hour *Steno de motu muſculorum geometrico*, as alſo *Borelli de vi percuſſionis*, and *Leotand de geometria practica*.

London February 4, 1667-8.

SIR,

I AM ſorry, I found nothing yet in your laſt, about the way propoſed here of eſtimating the preſſure of the ſea air: but I humbly thank you and the critick for the titles of the books, which concern the Greeks. What you were prevented in to ſay to ſome particulars of my laſt, I hope to hear from you about by your next, if it be worth while. If I can find out Mr. *Strode*'s lodging, I ſhall not fail, God willing, to acquaint him with your reſpects to him, nor to take of what he ſhall leave with me for you.

THE council of the Society having given order to print a hundred or two of the forms for ſubſcriptions, I preſume to ſend you one of them, ſince you have declared your willingneſs to contribute. If I had thought, there were any others at *Oxford*, that would caſt in their benevolence, I would have ſent more copies. We hope, we ſhall very ſhortly lay our foundation; and therefore the ſooner the contributors take care of paying in their reſpective

ſpective ſums, the more they will oblige the Society, in haſtening the execution of their deſign.

ON Thurſday laſt the Society met not, becauſe it was the 30th of January. At our next meeting we are like to have an experiment, to determine, whether there may be made a body more ponderous than gold, by trying, whether any quickſilver will penetrate into the pores of gold. And another, to ſhew the paſſage from the ear to the mouth, by cutting away the tympanum, and blowing tobacco fume through that organ into the mouth.

I HAVE now received *Stenonis Muſculi Deſcriptio Geometrica*, and *Alphonſus Borrelli De Vi Percuſſionis*; of both which, and ſome two or three books more, I intend, God willing, to take notice in this month's Tranſactions.

SINCE I wrote this, I was viſited by *R. Abendana*, who ſhewed me a letter from his brother now at *Oxford*, mentioning, that you had expreſſed to him your wondering at my not taking notice of the catalogue of Hebrew books, brought over by the ſaid *Abendana* to be ſold here. I was ſurpriſed to hear this, who, if I am not extremely miſtaken, mentioned in my very laſt that buſineſs to you, expreſſing, how I had endeavoured to recommend it to Dr. *Barlow* here in *London*, and making it my requeſt to you to aſſiſt in it, as much as your conveniency would permit. It is true, before I was ſpoken to by the Rabbi, I was ſilent of it in my letters to you; but that was upon the conſideration of your manifold other engagements, which I thought would not ſuffer you to meddle with books of that nature, as for your own uſe; and as far as it might concern the publick uſe of the univerſity, I judged, Dr. *Barlow* was more in the way of doing good in this matter, than any body, I know, of the univerſity. This day the ſaid *Abendana* entreats you, that, if you chooſe any books out of this catalogue, you would ſend, as ſoon as you can, your order for it, to leave them either with me, or ſome other perſon, you ſhall think fit; becauſe he is neceſſitated within a fortnight to return to *Amſterdam*. Sir, if you pleaſe, to look only into my laſt letter, you will there find, I did really recommend to you this affair.

THE French begin to declare their deſire for an accommodation with *Spain*; and certainly, if *Sweden* do enter into our league with the Dutch, there will be a peace in all appearance. And that the rather, becauſe one of the articles of that league imports, that if *France* do not comply with the conditions of peace, to be agreed on as reaſonable by the allies, they ſhall combine their forces, both by ſea and land, to compel the French to it, even to the reducing of them into that ſtate, they were in at the time of the Pyrenean treaty. And if *France* ſhould be ſo obſtinate, as to ſuffer things to run ſo far, they will run the hazard of loſing all they have gained in *Flanders*; whereas, if now they make peace, they are to keep what they have conquered in that country, or elſe to receive that, which ſhall be judged equivalent by the umpires.

THE French king, when he reſolved upon the expedition into *Franche Comté*, deviſed this ſleight to bring together his nobility to follow him. He gave out, he would keep an extraordinary carnival at *Paris*; which tempted the French gentry to flock thither in extraordinary numbers. Being thus come together in vaſt troops, the king declares to them one night, that the next day he muſt take the field, and that whoſoever loved him, would follow him. *Qui m'aime, me ſuive.* This made quickly up an army of 10000 horſe, who marched with their maſter without any heſitation they durſt give any ſign of.

THIS night is to be acted at court, by ſome of the fineſt gentlemen and faireſt ladies, the play of the Horatii; which has raiſed mighty expectations for great bravery, but finds not at leiſure, to be a ſpectator,

SIR,

your very humble,

and faithful ſervant,

OLDENBURG.

London, Feb. 11, 1667-8.

SIR,

I RECEIVED your laſt rich packet, full of philoſophical experiments and money. I ſhall hide the former till further order, and declare the latter at the firſt meeting of the next council, and acquaint you with the time of the firſt actual payment made by any of the contributors. I humbly thank you for all, as alſo for the communications of what concerns the Greek belief of the ſacrament, which I ſent away yeſternight.

WHATEVER you ſhall ſend to our noble preſident, I am ſure, he will take as much care of, as of any thing of his own.

HERE are arrived two of the Florentine virtuoſi; whereof the one is ſignior *Magolotti*, the other's name I have not yet heard. I met them yeſterday accidentally in *Weſtminſter-hall*, accompanied with Sir *Bern. Gaſcoyn*, who brought us together, and who intends to conduct them to the meeting of the Society on Thurſday next. They expect every day a packet from *Paris*, containing an exemplar of the Florentine experiments, to be by them preſented from cardinal *Leopold* to the Society. I intend this very night yet to give them a viſit, and as ſolemn a welcome as I can. When they return home, I may by their favour purchaſe a correſpondence with all the ingenious men in *Italy*, if I pleaſe, and am able to entertain it. I find, by Mr. *Colepreſſe*'s laſt letter, that he intends ſtill to travel; being deſirous, I would procure for him, ſome recommendatory letter, under the ſeal of the Society, to penetrate with the more eaſe and credit into the company and acquaintance of

the curious abroad. I may alſo accompany him with a particular letter of my own, and, if you pleaſe, Sir, to have any thing ſaid concerning him, as from yourſelf (which you ſeemed to give a hint of, in one of your laſt) I ſhall ſerve you in it very readily, upon the receipt of your inſtructions, as to the particulars you would have mentioned about it.

THERE came lately to hand a letter written from *Balſera*, which you know lyes near the Perſian gulf, relating, that thereabout had, not long ſince, been an extraordinary earthquake, which laſted thirty-two days and nights, and ſwallowed up three hundred houſes, and all the men: and that, where the earth thus ſunk with ſo many houſes, there appeared inſtead of it a large lake, ſome fathoms deep: and then, that at ſome diſtance from that place, another great lake, full of fiſh, did in thoſe thirty-two days of the earthquake, caſt up all its fiſh on the dry land, where might have been gathered many; and that, when the new great lake appeared, the old one dried up, and became firm land.

HERE was yeſterday made publick a ſmall book, licenſed by my lord *Arlington*, entituled, *A free conference touching the intereſt of* England, *in reference to the preſent French deſigns*. The ſhort of it is, that neutrality in this conjuncture of affairs is diſhonourable and dangerous for *England*; and that, in taking part, the intereſt and honour of *England* directs to join with *Spain*, rather than with *France*. It ſeems to be well done, but it will vex the latter of thoſe two crowns, not only by reaſon of the matter itſelf, but alſo of ſome ſmart expreſſions and reflections on the French.

HIS majeſty in his ſpeech yeſterday to the parliament acquainted them with the league made with *Holland*, with the neceſſity of a ſupply to make it good; and with his deſires of conſidering of an effectual way, to make all his proteſtant ſubjects worſhip God cheerfully and unanimouſly. But the houſe of Commons the ſame morning, before the king came, had voted, that his majeſty ſhould be deſired to iſſue a proclamation, reinforcing the execution of the act of uniformity, and other ſtatutes; which is a riddle to,

SIR,

your very humble,

and faithful ſervant,

OLDENBURG.

No news yet of the French king's ſucceſs in the *Franche Comté*.

London, Feb. 18, 1667-8.

SIR,

I HAVE not only received your ſealed paper, but alſo produced it before the Society, together with your intimation of giving the firſt example in making the Society a depoſitary of inventions. They were well pleaſed with it, and ordered, that it ſhould be delivered by me to our preſident, who was not there, but who received it from my hands two or three days after, and put it up in my preſence, in a box by itſelf, after he had written on it the day and year of his receiving it, as I had done the ſame minute it came to my hands. One of the company, though in another place, objected, that the matter not being named of ſuch notions or inventions, it might happen, that another might light on the ſame thing, and not only have it in his conception, but alſo bring it to perfection; and that in ſuch a caſe he ran the hazard of loſing the honour of what he had done and perfected upon the account, that another before him had given a hint of the ſame thing.

TO this I thought I could juſtly reply, that ſuch notions and diſcoveries being ſealed up, and thereby kept from coming to the knowledge of others, if another ſhould light upon and perfect the like, it would then be manifeſt to all the world, the latter had it not from the former, and therefore the Society would be ſo juſt as to teſtify ſo much, and withal to add upon occaſion, that the latter had not only conceived ſuch and ſuch a thing, without being beholding to others for it, but alſo rendred it compleat or uſeful (according as the matter may be.)

I DID not mention any thing in my laſt about the ſucceſs of the experiment about filling the pores of gold, becauſe nothing was done in it, that brought the thing to any certainty; though I believe it will be proſecuted with more care than hitherto. It is aimed at, to try, whether the pores of that metal, for all its compactneſs, will admit ☿ into them; and whether there may be made a ſubſtance compounded of two, that ſhall be heavier when mixed, than both of them aſunder.

I HOPE, when Dr. *Wren* comes to *London*, he will bring your leave with him of letting the Society know your way of determining experimentally, to what height water can be raiſed by pumping. I ſhall not ſo much as name it, becauſe I find not your permiſſion to do ſo. Some of the Florentine virtuoſi are come, but not yet their book of experiments. They were pleaſed the other day to give me a viſit, wherein they told me, upon my enquiry, that the chief ſubject of their experiments was the air and the preſſure thereof; which things, if they had been publiſhed three or four years ago, might perhaps appear new, but would hardly do ſo now. You will eaſily think I underſtand them, and why they prefaced ſuch a thing here, where they know, that argument hath been ſo plentifully and accurately proſecuted. They did enquire for you, and expreſſed their trouble for not finding you in town. Though they intend not to make a long ſtay, yet I am apt to think, they may find cauſe to ſtay ſo long as to ſee you here.

THE French king hath maſtered all *Franche Compté*, and is not like to ſtop there: ſome fear either *Antwerp* or *Luxemburg* will be next. The preparations of thoſe, whoſe intereſt it is to ſtop his progreſs, are both ſlow and ſlight, as far as I ſee, and others with me.

———ſerò medicina paratur
Cùm mala per longas invaluêre moras.

I will not ſay any thing of the late votes in parliament concerning the many miſcarriages in the late war: you will have that matter from better and ſafer hands. To morrow, I hear, they will fall upon the conſideration of the king's ſpeech, and chiefly upon money and toleration.

SIGNIOR *Borrhi* is at *Copenhagen*, if I am not miſinformed; which is all that can at preſent be ſaid of him, by,

SIR,

your very humble,

and faithful ſervant,

H. OLDENBURG.

WE do hear ſomewhat of a very odd diſeaſe of a youth about *Oxford*, of his bones being corrupted, ſo as that he takes them out of his jaw-bones and elſewhere by fragments of whole ounces weight, and that without any conſiderable pain. We ſhould be very glad to know the truth and circumſtances hereof from a good hand. If he be born of healthy parents, it were worth enquiry, whether his nurſe was alſo healthy, and free from the lues venerea.

London, Feb. 25, 1667-8.

SIR,

I HAVE received both the favour of your letter, which gives notice of your preſent, and the preſent itſelf. As I was ſurpriſed at it, ſo I checked myſelf for having left open my note about that book, and thereby occaſioned you that trouble. I have nothing to return, but my humble thanks, and this annexed print, which, I am perſuaded, you will eſteem upon the account both of your devotion to the inventor, (his majeſty) and the expeditious uſefulneſs of the contrivance itſelf. I muſt alſo add my thankfulneſs for the ſecond part of thoſe experiments you formerly were pleaſed to entruſt with me, who ſhall be very punctual in concealing them, till you allow me the liberty of making them known.

THE Italian philoſophers are gone, I preſume, this very morning for *Oxford*. They told me on Sunday laſt, when I reviſited them, that they would do ſo. I am confident, their converſation with Mr. *Boyle* alone will make them to be abundantly ſatisfied with their journey; though, I think, they will alſo make themſelves known to Dr. *Wallis* and Dr. *Wren*. They were on Thurſday laſt at our publick meeting in *Arundel* houſe, but came pretty late, and at a time when our preſident was not in the chair, whoſe ſingular dexterity of managing whatſoever is propoſed there you well know. There was only made before them the experiment of weighing tin and copper aſunder, and mixed both in the air and in water, and the mixed found heavier than the parts ſeparated. Mr. *Hook* has not proſecuted that experiment of making a body heavier than gold.

THERE occurring in *Steno*'s *Muſculi Deſcriptio Geometrica* an experiment of binding up the deſcending artery from the head, and thereby depriving immediately the animal of all ſenſe and motion, theſe Florentines were aſked, whether they ſaw the experiment made, it having been performed at *Florence*: they anſwered, that they had not, but heard M. *Steno* ſay, that he had done it, but ſometimes failed therein. Perhaps it will be experienced by Dr. *Lower* here.

THERE was read before the Society part of a letter written to me by Monſieur *Carcavy*, the famous French mathematician, and the preſent bibliothecarius of the royal library at *Paris*, and one of the chief of the new French experimental academy: the main thing was in theſe words:

Lors qu'il plait à Dieu donner des roys, comme nous les avons, l'on ne doit pas, ce me ſemble, leur rendre ſimplement l'obeiſſance, l'amour, et la fidelité qu'on eſt obligé, mais il faut, que ceux, qui ont le bien de les approcher, menagent autant qu'ils peuvent tous les momens d'un regne ſi heureux, pour ne ſe pas rendre coupables envers la poſterité de ne luy auoir pas procuré les avantages d'une rencontre ſi favorable, C'eſt à quoy vous et les autres meſſieurs de voſtre Societé vous employez ſi dignement: c'eſt à quoy nous travaillons auſſi dans noſtre academie, et taſchons de contribuer par nos ſoins et par noſtre diligence à ce que demande de nous la generoſité et la munificence du plus grand, et du meilleur roy, que nous ayons eu. Ee comme vos travaux et les noſtres ne tendent qu' à l'utilité publique, et que le ſecours mutuel, que nous pourrions nous rendre, ſerviroit beaucoup à l'augmenter, nous eſtablirons toute la correſpondence, que vous jugerez à propos: et en voſtre particulier, s'il vous plait, que je vous donne part de ce que nous ferons, ce me ſera une joye ſinguliere de pouvoir vous aſſurer, que &c.

OUR Society hereupon ordered only, becauſe this letter was not formally written from that Society to this, that no farther notice ſhould be taken of it, but that I might give him thanks in a private letter, and in general terms embrace his offer. This I was not very well ſatisfied with. I ſee punctilio's retard and obſtruct much good, both publick and private. But I muſt ſubmit.

SIR, if you come to determine any thing of the burning of bodies in vacuo, I ſhould eſteem it a great favour, to be inſtructed in the point, who ſhall declare no more of it, than you ſhall order me.

THE French army marches into the province of *Luxemburg*, and ſtrikes terror into the princes ſeated on the *Rhine*, particularly

Treves and *Mayence*. The king himſelf is returned to St. *Germain*, extolling his conqueſts, and making himſelf merry with our late league, ſaying; *Les foux et les gueux ſe ſont accordés*. But ſince *Spain* and *Portugal* are agreed on one hand, and *England* and *Holland* on the other, it would be a very ſtrange providence, if *France* ſhould ſtill go on to prevail.

WE ſay, the parliament will raiſe money neither by a land tax, nor by exciſe, but by an impoſition upon exceſs and luxury, as ſilks, ſpices, wines, coaches, ſedans, pictures, perfumes, perriwigs, comedians, mountebanks, ſhews, *&c.*

How far this will go, or whether indeed it will be fixed upon, is not yet known, but doubtleſs will be very ſhortly, conſidering the nearneſs of the ſpring, and the neceſſity of arming, to ſtop the French inundation.

THERE are at this time twelve ſhips deſigned for the *Eaſt Indies*, whereof eight are already gone for the coaſt, and four are to follow in March for *Suratte*. You will eaſily gueſs, we let not them go without our philoſophical commiſſions. If you pleaſe to ſend any new directions or enquiries thither, they ſhall be faithfully recommended by,

SIR,

your faithful humble ſervant,

H. O.

P. S. I ſent this morning by carrier a great packet of two *Petrus Bleſenſis*, printed at *Paris*, to *Oxford*, addreſſed to Dr. *Wallis*, accompanied with my letter to him, which I would deſire him to ſend for. I know, Sir, you will give him part of the news I have mentioned, and in particular of that of M. *Carcavy*. I forgot, I think, to deſire him to procure and ſend me one of his *Grammatica Linguæ Anglicanæ* for the uſe of a Pariſian virtuoſi; the ſooner the more welcome.

WHEN I wrote this, I had hopes to have got a print of the king's new way of fortifying; but he that promiſed it, hath failed me this time.

London, March 3, 1667.

SIR,

THE Florentine gentlemen met, it ſeems, with ſome impediments, which ſtoped them in their journey to *Oxford* on that day, they had appointed for it. They were again with us at *Arundel* houſe on Thurſday laſt, when we had no ill entertainment for them. There were produced by Mr. *Smethwick* ſome of his new-figured glaſſes, for which he hath obtained a patent from the king. He maintains, they are of a figure not ſpherical; whether elliptical or hyperbolical, he declares not. He brought in of three ſorts: Firſt, a teleſcope of four foot, furniſhed with three eye-glaſſes of the new figure, and a common object-glaſs, he not having as yet been able to make ſuch for any conſiderable length. This teleſcope being compared with a common, yet a very good one, ſomewhat larger than it, it was found, that it excelled it conſiderably; by magnifying the objects more, and repreſenting them more exactly in their due proportions, without colours, if the eye were held juſt in the center of the glaſs. Then there was a reading or microſcopical glaſs, which ſhewed the letters, and magnified them up to the very edges, from one brim to the other thorough the center perfectly. Laſtly, two burning concaves of that figure, (both of ſix inches diameter, but of ſuch different cavities, that the focus of the one was but three inches diſtant from the center of the glaſs, the focus of the other, ten inches) did, when held to a lighted candle, warm the faces of thoſe, that were preſent, at four or five foot diſtance, and when approached to the fire, burn gloves and clothes at the diſtance of a yard and more. The inventor added (appealling for it to the teſtimony of the biſhop of *Saliſbury*, as an eye witneſs) that the former of theſe concaves had by the ſun turned wood into a flame in the ſpace of ten ſeconds; and the latter, in the ſpace of five ſeconds, and that in autumn about nine in the morning, the weather gloomy.

OUR preſident, before he will declare any thing poſitively of the figure of theſe glaſſes, will by a gage meaſure them; and if the invention bear his teſt, it will paſs for current, and be no diſcredit to the Society, that a member of theirs is the author thereof.

THEN, there was made *Steno*'s experiment, of tying up the deſcending artery of a dog, to ſee whether, thereupon, all motion would ceaſe in the animal, as *Steno* affirms it does. But it ſucceeded not with us, who made only a compreſſure of the veſſel, with a finger, and not a ligature. This experiment is to be repeated with more exactneſs, before we decry *Steno*.

FURTHER, there was tried your experiment of compreſſing the air upon ſhining fiſh, which ſucceeded very well, the air compreſſed upon the fiſh rendering the light of it conſiderably more vivid, than before; the Florentines being very well pleaſed with the ſight thereof, and made acquainted, we were obliged to Mr. *Boyle* for it.

NEXT, there was conſidered a letter, written to me by doctor *John Palmer*, that mathematical divine, who is now arch-deacon of *Northampton*; in which letter, the author acquaints us of an attempt of his, to reſolve all algebraical queſtions by the common *regula falſi*; and that he had made ſome progreſs in it, declaring his purpoſe to communicate to us his further ſucceſs therein, and referring us to a place in *Pitiſcus*, confirming his opinion, in theſe words: (Trigonom. l. 5. in append.) *Regula falſi in trigonometria tam magnum uſum habet, ut diſcipulum ejus artis à tricis algebraicis prorſus liberare poſſit.*

WE had alſo a full relation of the waterman, whoſe temporal muſcle was broken by a violent

a violent ſtroke, whereupon two ſpoonfuls of his brain came out, and yet this man recovered, without any conſiderable prejudice to his intellectuals.

THERE was alſo an account given of a ſtone, taken out of the bladder of Sir *Thomas Adams*, lately deceaſed, which weighed 25½ ounc. and 2 drams; and yet the breeder of it ſaid not to have complained of any conſiderable trouble, till a few days before his death, when, it ſeems, the ſtone, that before was faſtned to the bladder, fell down and ſtopped up the paſſage. We are on Thurſday next to ſee the ſtone itſelf.

THERE were alſo produced ſeveral curioſities, to be lodged in our repoſitory, as a great bone petrified; a whole egg in an egg; a ſtone bottle, which ſeven years ago was filled full with Malaga ſack, and well ſtopped, but is now empty, though ſaid never to have been opened, and the outſide of it is all covered over with a thick mucous coat, having ſtood in a corner of a wine-cellar all that time.

No great news from abroad; only that *Munſter* is arming again, and ſuſpected to be hired by the French, to infeſt the Dutch again. *Spain* is ſaid to be willing to the alternative, but I doubt, whether France be ſo too. I fear, they will, upon their late ſucceſſes in the *Franche Comté*, carry it high, and recede from their engagement, and take the field too early for their adverſaries.

SIR, the particulars abovementioned I would beg Dr. *Wallis* may have a ſight of; to whom I cannot now in a letter apart acknowledge the receipt of his. Mean time, I am his very humble ſervant, and ſhall, God willing, obſerve, what he intimates about another copy of P. *Bleſenſis* for *Baliol* college.

MR. *Colepreſſe* is ſhortly going over, as I underſtand by his laſt to me. I have obtained for him a letter recommendatory upon parchment, from the Society, with their common ſeal to it; and I have preſumed to ſecond it by a private letter of my own to Dr. *Sylvius* at *Leyden*, wherein I have not forgot the expreſſions of your eſteem for this friend of ours. The ſaid doctor, as I have ordered the matter, will recommend him all over the Low-countries, and in *Denmark* and *Germany*, into all which parts he declares his intention to go: and if he travel alſo into *France*, upon the firſt notice ſent me I can give him there as good philoſophical acquaintance, as he can deſire.

HE intimates, at the cloſe of his laſt letter (which was dated February 22.) that that week had produced extraordinary high tides, raiſed by the ſtorm, as they ſuppoſed; but yet that himſelf obſerved one, on February 21, in the morning, very high, yet the weather calm. This alſo Dr. *Wallis* ſhould know from,

SIR,

your very humble,

and faithful ſervant,

H. O.

London, March 10, 1667-8.

SIR,

HOWEVER you are ſo ſparing in your intimation of the entertainment, you gave the Italian virtuoſi, yet I doubt not, but, when I ſhall ſee them, they will be very liberal in making their acknowledgments, as it deſerved. I found yeſterday, at Mr. *Martyn*'s, a book of the Florentine experiments which they had ordered to be bound for Thurſday next, to be then preſented by them from P. *Leopold* to the Royal Society. I could but caſt my eye upon the heads treated therein; which, as I remember, are theſe in their own expreſſions:

Experienze appartenenti alle naturale preſſione dell'aria.
——— *Intorno agli artificiali agghiaciamenti.*
——— *Intorno al ghiacio naturale.*
——— *Intorno alla variatione della capacita di metallo & di vetro.*
——— *Intorno alla compreſſione dell'aqua.*
——— *Per provare, che non v'é legherezza poſitiva.*
——— *Intorno alla calamita, o magnete.*
——— *Intorno all'ambra & altre ſuſtanze di virtu elettricha.*
——— *Intorno ad alcuni cambiamenti di colori in diverſi fluidi.*
——— *Intorno à movimenti del ſuono.*
——— *Intorno à i projetti.*
Experienze varie.

I DOUBT, by ſome circumſtances, I ſpied, that this book hath been craftily compoſed. But I ought not to anticipate.

YOU thought not fit to name the ſubject of that experiment, which you mention, you had made ſo, as it is likely it will diſpleaſe the peripateticks. I am to preſs nothing.

WE intend to try *Steno*'s experiment about the ceaſing of all motion upon the deſcending artery's being tied up, over and over again, before we decry it. Mean time, I neither ſay, nor found cauſe by *Steno*'s book to ſay, that he mentions it as a new thing, and a diſcovery of his own, that the gloſſopetræ and other ſuch ſtones have been animals petrified.

WE were aſſured, that the bottle thus coated, as I mentioned in my former, was never opened, ſince it was filled with the Malaga ſack; but, *ſit penes authorem fides:* we only ſet it down, as it was related to us, without putting any great weight upon it.

THURSDAY next we are again ſeverely to examine Mr. *Smethwick*'s glaſſes, though we are pretty well ſatisfied already, that they are not ſpherical, and that they exceed thoſe, that are ſo, conſiderably. But we cannot be too rigid in the examen, before we give a publick teſtimony of it to the world, as is deſired of us.

THERE is, it ſeems, a diſpute in *France*, about this argument, viz. *Si l'on peut juger de combien de degrez une lumiere eſt plus grande qu'une autre, comme l'on juge de combien de tous un ſon eſt plus aigu qu'un autre.*

MONSIEUR

MONSIEUR *Auzout*, I am informed, ſaith this: *Que l'ouïe a cet avantage par deſſus tous les autres ſens, qu'elle juge non ſeulement de la difference, mais encore de la quantité & de la raiſon de ſon objet. Car outre que l'oreille connoit, qu'un ſon eſt plus aigu qu'un autre, elle connoit encore de combien de tous il eſt plus aigu: mais quoyque l'oeil appercoive, qu'une lumiere eſt plus grande qu'une autre, il ne ſcauroit determiner de combien de degrés elle eſt plus grande. Et le meſme Auzout adjouſte, qu'il faudroit taſcher de connoitre cette raiſon, par ce qu'on en pourroit tirer de grands avantages pour la perſpective & pour la peinture.*

FROM another place, viz. *Lyons*, I am informed, that there was lately opened the body of a child, that died of five years of age, and had ſo horrid an abſceſs in the left cavity of his thorax, that they took out above ſix pound of pus: beſides, they found the heart of the ſame child in the right ſide of the thorax, and the baſis downwards, and the apex upwards: whereof I intend, God willing, to give the particulars more at large, though not in the Tranſactions of this month (which are already full) yet in thoſe of the next.

SIR, I delivered on Sunday laſt to Mr. *Hatherton*, a big packet of letters for you from M. *Colepreſſe*, to be ſent by carrier; which I mention, that you may ſuſpend your writing to him; till they come to your hands, which doubtleſs they will do before the end of this week.

THE biſhop of *Saliſbury* took occaſion the other day of his own accord to expreſs his great earneſtneſs to ſee me provided for with a recognition for my labours and concerns for the Society. He would, he ſaid, have it urged in council, and was pleaſed to add, that he for his own part was aſhamed, that I was ſo long neglected, who had for ſo many years ſpent all my time and all my pains upon the buſineſs of the Society, without any conſideration for it. I confeſs, Sir, I make very hard ſhift to weather it out; and I could be contented, it were inſiſted on in the council, but that I ſhall want your preſence and favour there, to repreſent a little the particulars that paſs through my hands, and the difficulties, I groan under; which I cannot ſo well ſpecify to others, as I know you will give me leave to do to you. I am,

SIR,

your very humble and faithful ſervant,

H. OLDENBURG.

London, March 17, 1667.

SIR,

THE Society hath as yet had no account upon the letters, they ordered to be written by *D. Pope* and myſelf to Dr. *Wellington* and Dr. *Wren*. Whether they will on Thurſday next, time will ſhew. At our laſt meeting, the Florentines (towards whom I intend to diſcharge myſelf of the commiſſion, you have given me, as ſoon as I ſhall ſee them again) preſented in the name of prince *Leopold* the pompous book of their experiments to the Society; for which they received ſolemn thanks, which the ſecretary was commanded by the preſident to deliver in Latin. The book was committed to the peruſal of Dr. *Merrit*, and Dr. *Ball*, who are maſters of that tongue, in which it is written. When their account ſhall be brought in, you will not want it long, though I hope, you will by your much deſired return prevent my writing of it. Mean time, I underſtand, there is nothing new in it, as to us, except it be perhaps ſome experiments of amber, and a way of making a map of a country by ſounds. I perceive by your laſt, you have not left the former untried; and I am much miſtaken, if you have not ſpent ſome time in meaſuring the extent of the paſſage of ſounds. I am very glad, you have lighted on your papers again, which belong to the appendix of the Pneumatical Experiments; and thence hope, that appendix will now ſhortly come to light, in which hopes and wiſhes of mine I have the concurrence of very many. I wiſh, Sir, you had given me the titles of thoſe new treatiſes, you ſay to have ſeen, where you are. Surely, they are not yet tranſmitted hither. In the Tranſactions of this month I mention only two books, the Florentine Experiments (only as to the heads of them) and a pregnant mathematical book (*Vera circuli & hyperbolæ quadratura*) by Mr. *Gregory*, a Scotchman, a treatiſe much applauded by our preſident, as will appear by the account, given thereof in my papers, now under the preſs.

WHAT I mentioned to you in my laſt of M. *Auzout*'s conſiderations about ſounds, I can now enlarge with ſome animadverſions, made thereon by one *P. Poiſſon*, *Pere de l'Oratoire*, as they came to my hands ſince. He diſcourſeth thus:

Il faut remarquer, qu'il y a beaucoup de difference entre le ſon & le ton. Car le ſon eſt une choſe abſoluë; le ton eſt la rapport, & l'union, qui ſe fait d'un ſon à un autre: ainſi le fà, conſideré abſolument, eſt un ſon; mais il devient ton par rapport au ſol ou à ſon octave. Or je ſuppoſe, qu'une baſſe & un deſſus chante ce fà à l'uniſſon; je defie l'oreille la plus delicate de determiner, de combien de degrez cette baſſe eſt differente du deſſus. Mais ſi le deſſus chante un la, pendant que la baſſe chantera un fà, on s'appercevra bien alors de cette tierce majeure, & des degrez, qui la compoſent.

Cela poſé je dis, que l'oreille n'a aucun avantage ſur les autres ſens, & que chaque ſens eſt à ſon objet, come l'ouïe eſt au ſien. Car ſi l'oeil ne peut pas juger, combien une meſme couleur, comme le bleu, eſt plus ou moins chargé qu'un autre bleu; l'oreille ne peut pas non plus juger, de combien une voix, qui chante à l'uniſſon, eſt plus ou moins haut que l'autre; ſi l'oreille juge, de combien de degrez le ſol eſt plus eſlevé que l'oet, l'œil s'appercoit auſſi de la difference, qu'il y a entre le cramoiſy & le jaune, contant les degrez de difference par les couleurs compriſes entre deux, ſcav: la couleur

de

de feu, le rouge, l'incarnat, &c. *Enfin, comme l'oreille connoit, ſi un ton ou un ſemi-ton eſt juſte, par exemple, ſi le Re n'approche point de l'Ut ou du Mi; l'oeil s'appercoit auſſi, ſi le rouge eſt dans ſa beauté, & s'il ne tire point trop ſur le jaune, ou ſur le cramoiſy, que je ſuppoſe eſtre le plus haut degré de rougeur. Voila ce qui n'eſt venu dans l'eſprit touchant cette difficulté, que je reſerve à traitter plus amplement dans un autre lieu.*

WHAT to ſay to this, I know not: I muſt leave it to knowing men, to conſider it farther.

I RECEIVED lately a letter from Mr. *Glanvill*, full of reſpects to you, and expreſſing his readineſs to make careful enquiries concerning the waters of the *Bath*, where he wiſhes, that Mr. *Boyle* would give himſelf the trouble of furniſhing him with ſome queries to direct him. Sir, I join my requeſts to his wiſhes, and, I doubt not, but we ſhall receive as good an account to ſuch queries, as we have done to thoſe about mines; which you will ſee upon your return to *London*. I can aſſure you, that thoſe letters of Mr. *Colepreſſe* had not been above two or three days in my hands, when I ſent them to M. *Hatherton* for you. But I ſuſpect, Mr. *Strode* had kept them long with him, by reaſon of his ſickneſs here in *London*, or of forgetfulneſs, or hope of ſeeing you here.

FROM *France* I have only this civil news: *M. Colbert doit aller à Aix vendredi, qui vient* (the letter was dated March 21, new ſtile) *avec tout cela on doute de la paix* (the former letter ſounded otherwiſe) *& tout le monde croit, que Caſtel-Rodrigo n' a point de pouvoir.*

I HOPE Dr. *Wallis* received my letter of March 10. I am,

SIR,

your very faithful ſervant,

OLDENBURG.

SIT, I had almoſt forgot to give you notice of what I had from a very good hand at *Copenhagen*, that ſignior *Borrhi* is there, in great favour and credit with that king, whom he is ſaid to have given great ſatisfaction in many things, beſides ſeveral great cures he hath done in that place.

SIR,

I FIND by your laſt return, I am guilty of an unſeaſonable importunity, expreſſed in my former, which yet, ſince I am not wont to be ſo in my own particular concerns, I am apt to believe, I ſhall the more eaſily obtain your pardon, for, the more it proceeded from a zeal to further a publick and uſeful work, as the building of a college for the Royal Society is conceived to be by the council, as being that, which will in all likelihood eſtabliſh our inſtitution, and fix us (who are now looked upon but as wanderers, uſing precariouſly the lodgings of other men) in a certain place, where we may meet, prepare and make our experiments and obſervations, lodge our curators and operators, have our laboratory, obſervatory, and operatory all together. It is a maxim, I learned in my logick, when a boy; *Qui amat finem, amat & media ad finem.* And I confeſs, I am as averſe from, and as much a bungler in, begging, as any man; but I can deny myſelf, and go againſt the ſtream of my inclinations, when the proſecution of honour and publick uſefulneſs is in the caſe, as here it is; and therefore am not aſhamed to beg, when it is a means to accommodate and promote the good ends of the Society's inſtitution. I think, ſince I have endeavoured to ſerve them to the utmoſt of my power theſe ſix years gratis, and am a beggar to boot as to my private fortune, I may extend my endeavours ſo much farther, as to go a begging for the Society's eſtabliſhment, eſpecially in ſo good company, as our preſident Mr. *Henry Howard*, Sir *Robert Moray* (though abſent) and ſome others have a mind to be. Sir, you will pardon my fervor, though, perhaps, accompanied with new guilt (that of indiſcretion.)

I CAN eaſily gueſs the reaſon, which induces you not to pronounce at preſent in Mr. *Hook*'s propoſal. I ſhall be very glad to receive the thoughts of thoſe two ſagacious perſons, you have named, concerning it; which may be ſo managed, as that your way for obviating the main inconvenience of the baroſcope at ſea may be intimated in their declaration, as a thing, they have heard you diſcourſe of to them.

SIR, I am going to anſwer the letters and papers received from the *Baltick*, though I ſhall not ſend it away, till next week. If you think fit to ſay any thing to the new Dantiſcan conſul by my pen, I can inſert it; if not, I ſhall let him know, what you mentioned in your laſt, of your pre-engagement in other matters.

WE had before us at our laſt meeting the two weather-glaſſes, contrived by Mr. *Hook*, for the obſervation of weather at ſea; as alſo a new contrived engine for grinding and preſſing of cyder-fruit all at once: and likewiſe a way of promoting the vibrations of pendulums ſtraight, without checking them at all. But my lord *Brounker* was not there. You know, Sir, what I mean.

I RECEIVED lately a return of that Turkiſh ſheet of the New Teſtament, which, a good while ſince, I ſent to *Amſterdam*. It came back with many animadverſions, and with a letter reflective enough on the author of that verſion. But having ſpoken with Mr. *Seaman* hereupon, I am pretty well ſatisfied about it, and have deſired him, to vindicate both himſelf and his work as fully as he can. I ſuppoſe, he has already written about it to *Oxford* (as I intended to have done to you laſt week, but that I forgot it) and conſulted with his friends there. Mr. *Hyde* will do a good ſervice to ſome proteſtants in *France*, to give what information he can about the ſenſe of the Greeks of this laſt fifty or ſixty years in the point of tranſubſtantiation (for that is

particularly deſired, the Romaniſts pretending, that they have of late years complied with them) and that as ſoon as conveniently he can. I am ready to ſerve him again to my power upon all occaſions.

SIR, doubtleſs you have heard ere this of our league with the Dutch, Swedes and Brandenburg, for interpoſing as umpires in the conteſt between *France* and *Spain*, reſolved to oblige thoſe two parties to comply with what the allies ſhall judge reaſonable and juſt, or to expoſe the refuſing party to the danger of being invaded by thoſe judges. This certainly will put the French king to new counſels, who, we hear, is reſolved for a journey, to be begun, as the laſt letters ſay, the 3d of February (new ſtile) but not certainly known whither, nor for what deſign, though intimated to be of great importance. And ſome do venture to write, that it is to ſurpriſe *Antwerp*; others, to attend Don *Juan d'Auſtria*'s motion, and, if poſſible, to cut him off in his paſſage into the Spaniſh Netherlands, he being reported to be in the head of 10000 men, moſt Germans.

IF you will have the patience to hear the magnifying diſcourſe for the French king, I will give it you in my author's own words, *viz.*

Le voyage du roy eſt certain. Il y a bien de l'apparence, que les Païs Bas ſeront bien toſt à luy, ſes ennemis n'ayans ny conſeil, ny ſoldats, ny capitaines. L'empereur ſera neutre. Les Hollandois n'oſeront l'irriter, & les autres princes ne pouvent pas agir d'eux meſmes. La compagne, qui vient, en toute apparence ſera auſſi heureuſe que celle de l'année paſſee, & peut eſtre d'avantage, ſi la paix ne ſe fait pas; à quoy il y a peu de diſpoſition.

Non obſtant la guerre, on va payer les penſions des gens de lettres, qui montent à pres de 100000 *livres par an. Outre cela, il y a un fonds pour les baſtimens. Enfin jamais il n'y a eu de roy, qui ait plus de lumiere, de conduite & de bonheur que le noſtre.* Beſides this, he ſaith, *Qu'un des principaux de l'Academie de Caën a propoſé à M. Colbert, le ſecret d'adoucir l'eau de la mer, qu'on doit examiner.* This we did let fall to the ground. I am,

SIR,

your very humble ſervant,

H. O.

London, March 24. 1667.

SIR,

THERE was at our laſt meeting brought in a ſlight account concerning the book of the Florentine Experiments; but it was not Dr. *Merret*'s, who intends, as himſelf told me this very morning, to read it thorough with attention, and compare it with what he knows to have been already done in *England*. After his company, I received the viſit of a gentleman, who gave me notice, that a friend of his, whom he ſcrupled to name, reſiding now at *Rome*, had ſent him an Italian journal *des Scavans*, or philoſophical Tranſactions, which he ſhewed and left with me, lately begun to be publiſhed at *Rome*, in imitation of the French and Engliſh: beſides, he acquainted me, that his ſaid friend offered himſelf (which he read to me out of the letter) to procure for the Royal Society a correſpondency all over the world, by means of the miſſionaries, who from *Rome* are ſent into all parts, ſaid by the author of the letter to be learned men, and capable to give full ſatisfaction in matter of curioſities of all ſorts. This latter part I much doubt of, conſidering the principal end of ſuch men's voyages, which is, to propagate their faith, and to greaten and enrich themſelves by their craft; though I deny not, but ſome of them are alſo ingenious, and curious in matters of a philoſophical nature; but thoſe that are ſo, are, I doubt, obliged, or, at leaſt, think themſelves ſo, to diſcover ſuch obſervations to their own tribe, and would, I believe, be unwilling to communicate them to hereticks, except they were ſure, they ſhould be very well requited for it. Mean time, I can do no leſs, than acquaint the Society with ſo civil an offer; and, if they will be at the charge of ſuch a commerce, and ſhall judge it beneficial to their deſign, I am ready to extend my ſervice that way.

IN the aforeſaid Italian journal (which they call *Il Giornale de Letterati*) are contained, 1. An account (but a very ſlender one) of the book of the Florentine Experiments. 2. An account of ſome eccleſiaſtical books, and a book of the lives of painters by *Carlo Dati*. 3. Obſervations, *della ſtella rinaſcente nel collo della balena li* 14. *Giennaro* 1668. *h.* 2. *n. s.* (I think, it was about the ſame time, that you, Sir, and Dr. *Wallis*, obſerved the ſame ſtar at *Oxford.*) 4. Obſervations made upon a great fiſh, diſſected in the Pariſian academy. (This was printed long ago in one of the Tranſactions.) 5. An extract out of the Journal of *England*, (ſo they miſcal the Tranſactions) concerning a way of keeping a dog alive without the motion of his lungs, by keeping them only extended with freſh air.

IF this way of printing journals ſpread overall, we may have a good general intelligence of all the learned trade, and its progreſs.

FROM *Caën* in *Normandy*, I received lately this anatomical account.

On a fait icy la diſſection des yeux d'une taupe. Il eſt certain, que la peau eſt ouverte & fenduë à l'endroit des yeux, ce qu'on n'avoit pas remarqué icy auparavant. L'oeil eſt enveloppé dans les membranes, dont la peau eſt compoſée. Il n'eſt pas plus gros, que la teſte d'une petite eſpingle. Il eſt obſcur & noir, horſmis quand il eſt regardé ſelon ſon axe oppoſé au jour. Car eſtant vû en ce ſens là, l'axe & ſes environs paroiſſent tranſparens. L'ayant ouvert, on n'y remarqua pas de chriſtallin; mais cela eſt ſi petit, qu'on s'y peut tromper. Il ne paroit point non plus de nerf optique parmy les petits muſcles, qui y eſtoient attachez.

attachez. Il n'y à point d'orbite au crane; mais l'une des cavitez, qui ſont proche de l'os Zygoma, luy ſervent d'orbite. On à deſſein de deſſecher le crane, et d'examiner ce qui eſt dans la teſte. Cette diſſection ſe fera encore plus exactement.

CONCERNING grafting, this is added: *On à fait greffer des contes les plus bizarres, pour voir ce qui en arrivera. Ce qui ſervira non ſeulement à connoitre juſques où la nature peut aller en la multiplication des vegetaux, mais encore à augmenter le nombre des fruits.*

AT our laſt meeting we had the ſight of a new kind of large furnace for hatching of chickens; as alſo a new cyder-preſs engine, to make cyder with more expedition: both are to be put into practice, which will try their ſufficiency.

MR. *Glanvill* hath ſolicited it ſeveral times (though I have, I think, mentioned it but once to you) that you would favour him with ſome queries for the *Bath*, he not judging himſelf to be philoſophical enough to deviſe matter of his own. But, I ſee, we muſt leave this to your better leiſure. I ſhall endeavour to get an extract of the charter of the Engliſh Hamburgh merchants, and when I have got it, it will quickly be ſent you from,

SIR,

your very humble ſervant,

H. OLDENBURG.

THE French act craftily. They will doubtleſs ſurprize the Spaniards; but, I hope, they will not us in the Channel, becauſe we have abroad about twenty frigats, and are equipping twenty five more. The French king courts the whole electoral college highly, and would have them the mediators of the peace; of which thing, I am apt to believe, he thinks no farther, than to amuſe his antagoniſts with it.

SIR,

I CANNOT yet obey you in delivering your letter for Sir *John Finch*, nor your book to be ſent to prince *Leopold*, becauſe the one is not yet returned to *London*, nor the other come to my hands; neither have I given your letter to Mr. *Povey*, wherein the Ethiopian gentleman is concerned, finding that by reaſon of my long ſilence, who made him diffident of the ſucceſs of his deſires, he hath let fall the deſign of that voyage, and before the arrival of your intended favour (which notwithſtanding he is very ſenſible of) engaged himſelf another way for this winter. The other ſtranger, who is a hard ſtudent in phyſick and chemiſtry, and a great friend to that philoſophy, that explicates things by mechanical and intelligible principles, will be very glad to hear your objections againſt his menſtruum, and will be found, I think, pretty ready to ſatisfy ſome of them; though he pretends not to make that liquor to be the ſame with the grand alkaheſt, but analogous thereunto. Another gentleman, that came not long ago from *Paris* hither, preſented me with a ſmall treatiſe, but of a big title, bidding all the world to make bonefires, becauſe henceforth merchants and ſeamen ſhall be enabled to ſail againſt wind and tide, huſbandmen to plough without horſe or oxen, all that uſe waggons, mills, watches, *&c.* to make all thoſe machines move inceſſantly and of themſelves. To the perpetuum mobile he joins the promiſe of the quadrature of the circle, the ſecret of longitudes, the cauſes of the reciprocation of the ſea, of the winds, and of intermitting fevers. I believe, himſelf was in a continual raving one, when he wrote this piece, conſidering the commonneſs of what he ſaith, and the flatneſs of his ſtyle, eſpecially the confidence and oſtentation, wherewith he delivers all, pretending, that he carries away the bell from the renowned prince of *Mirandola*, that anſwered upon all things known, and ſaying, that himſelf can anſwer to things not known, and unty Gordian knots, and reſolve inſoluble queſtions: yet the philoſopher's ſtone he will not meddle with, becauſe he eſteems that ſecret, if diſcovered and divulged, would prove more pernicious than beneficial. But I will leave this advocate (for that is his profeſſion at *Rouen*) to plead for his own dotage, and tell you, what is more credible, *viz.* that the Spaniſh embaſſador, the count of *Fuenſaldagna*, refuſed the king of *France* his preſent, which was a diamond of 50,000 livres, becauſe that king refuſed to ſee him by reaſon of the late ceremonious ſcuffle between the two embaſſadors here at *London:* and that *Fouquet* is rendred every day more and more odious, by reaſon of the farther diſcoveries that are made of his deſigns and intrigues, to remove the queen-mother of *France* for the compaſſing of his ambitious ends.

SEVERAL of the chief of our *Greſham* Society, and among them the preſident, being out of town, I went not yeſterday thither, thinking there would be little or no company. I hope we ſhall ſhortly enjoy yours here, and have then a ſhare in that, which your phyſick will not permit him to have now, who is,

SIR,

your faithful and humble ſervant,

H. O.

MR. *Herringman* preſents his humble ſervice to you, and ſaith, that Mr. *Browne* is ſo inconſiderate, as to offer him, in good earneſt, loſs for the Latin books of Eſſays: whereupon I told him, that he needs not to be haſty, nor pin the book upon any, being ſure, he will want no opportunity in time, to diſperſe it with great advantage.

WHEN I was going to ſeal this, a porter brought me from *Warwick Lane* two copies of your

your Latin pneumatical book, whereof I ſhall immediately deliver one to Mr. *Herringman*, to have it princely bound up, the other I know not whom it is for, ſeeing you left one with me very handſomely bound up for Sieur *Viviani*.

London, March 30, 1668.

SIR,

I AM as well obliged to you, as M. *Paiſen*, for the philoſophical entertainment given him. The fame of the Society riſeth very high abroad, and makes ſtrangers flock hither in troops; inſomuch that ſince this March I have had no leſs than two dozen travellers addreſſed to me, whereof ſome make quick diſpatch, others ſtay longer; and of this latter ſort you have now and then your ſhare, and perhaps a greater than you care for. I have not yet had time to read *Bartholinus*'s three and four centuries of experiments; but I have peruſed, ſome weeks ago, *Barbatus de ſanguine*, *&c.* in order to mention him in the Tranſactions, but I found, I had no room for him, nor had I ſince. I have alſo ſeen the *Obſerv. Anatom. Coll. privati Amſtel.* and *Sanguerdius de Tarantula*, and I may find place to ſay ſomething of this laſt in the next book. However, Sir, my thanks are the ſame to you for naming them to me, as if I had known nothing of them. I am now contriving a method to ſettle my correſpondence with *Rome*; and I have a proſpect, if God bleſs us, of a compendious way of fetching in for the Society whatever is ingenious, curious, and new, from the moſt conſiderable and moſt civilized parts of the world, *ni deſit rerum gerendarum nervus.*

I WAS lately offered alſo to correſpond with the new academy of experimenters at *Caen* by the means of Monſieur *Huetius*, of whom they write me from *Paris*, *que c'eſt un homme d'eſprit, et capable de faire beaucoup de choſe.* And it is added, *que monſieur Colbert à promis auſſi un fonds à cette nouvelle academ. de Caen pour faire des experiences, et que, ſi on ne fait rien en France, il ne tiendra pas au roy, qui contribue autant qu'il peut pour aider ceux, qui ont envie de bien faire.*

THIS, methinks, ſhould be lodged and improved in a proper place here; but that we want zeal and induſtry, and conſequently muſt needs fall under them in a ſhort time.

THE Pariſians have made lately a diſſection of a camel, where they ſay they have obſerved no inconſiderable particulars; and thoſe of *Caen* have made the diſſections of the eye of a hawk, and of the body of an oiſter; which, I find, are like to be publiſhed ere long.

MONSIEUR *Sluſius* at *Liege* ſent me lately a large letter, by which I find his readineſs of giving us an account to what enquiries we ſhall make about their country, eſpecially mines, Spa-water, immature and volatile metals, of divers ſorts of coals, ſuch as take fire quickly, and are alſo quickly conſumed, and others of a contrary quality. And after he hath given me in his letter a general deſcription of the country, he concludes that part thus; *Et hæc quidem ὡς ἐν τόπῳ dicta ſufficiant. Exequar uberius et per partes, cùm quòd potiſſimùm vobis gratum futurum eſt, indicaveris.*

AFTER this he comes to yourſelf, Sir, in theſe words:

Incidi nuper in viri nobiliſſimi R. Boylii experimenta phyſica, (ſerò enim ſimiles deliciæ ad nos perveniunt) in quibus cùm ea legerem, quæ de natura fluiditatis ac firmitatis obſervat vir nunquam ſatis laudatus, rediit in memoriam experimentum olim à me factum non abſimile illi, quod commemorat, p. 129. (which in the Engliſh is p. 231.) *de liquore ſcil. qui calore non magno fluiditatem, et levi frigore firmitatem adipiſcitur. Salinus nempe eſt, ex nitro fixo per deliquium ſoluto, ſeu Glauberi alcaheſto, et ſpiritu chalcanthi præparatus. Si enim liquores illos ſimul junxeris, et ſalem præcipitatum ſiccaveris, ac demum adhibito ſpiritu chalcanthi, quantum opus erit, eundem diſſolveris, hic liquor leviſſimo frigore concreſcet. Ac nemini, æſtate proximè elapſâ in phiala à me ſoli expoſitum ut liqueſceret, in umbra, quamvis aurâ tunc minimè frigidâ, concreviſſe. Variis autem modis idem fieri poteſt, quorum multos cum expertus fuerim, videtur mihi fore, ut hoc ſemper accidat, mixtis, ut præſcriptum eſt, duobus ſalinis liquoribus, dummodò ex diverſæ ſpeciei ſalibus, uno volatili, altero fixo, parati ſint.*

MAY not ſuch liquor as this be of good uſe in thermometers?

FOR ſtate-news this:

Tout ſe prepare à la guerre; neantmoins les officiers craignent la paix. On n'entend plus parler de D. Jean. Le roy pourra prendre encore quelques bonnes places cette campagne, et avancer tousjours; les Eſpagnols n'eſtans pas en eſtat de luy reſiſter, ny de tenir la campagne. On mande de Hollande, qu'on y fait de grands preparatifs, et qu'on croit, que la paix ne ſe ſera pas.

L'Eveſque de Munſter marchera contre Mrs. les Eſtats, quand le roy ſera en Flanders.

Si la reyne d'Eſpagne continue à ne vouloir point oüir parler de traiter ſur le pied de l'alternative, la paix ne ſe pourra pas faire.

On à veu à Bayonne une comete, et en Provence auſſi. Un Jeſuite l'a veuë auſſi à Lyon; mais perſonne ne là obſervée icy à Paris.

On me doit envoyer de Caen des ſels, qui ont eſté tirés de la roſée, ou du moins une relation exacte de ce qu'à fait ſur cela un chemiſte fort habile. I am,

SIR,

your very humble

and faithful ſervant,

H. OLDENBUGR.

London, April 7, 1668.

SIR,

MONSIEUR *Paiſen* gave me his farewell on Saturday laſt, and ſeemed to be very well pleaſed with the commiſſion I

gave him, for ſeveral philoſophical matters, to be enquired after and promoted in *Germany*. There is a very able man, by deſcription, at *Hamburgh*, a diſciple of *Jungius*, and a keeper of many of that able man's unpubliſhed papers. Among other things, I have by a letter to that perſon urged the diſſection and edition of thoſe manuſcripts, eſpecially his animadverſions upon *Gaſſendus* and *Deſcartes*, and his thoughts upon our *Verulam*; as alſo his collections concerning arts and trades, of which I hear he had made conſiderable ones. I hope I ſhall receive a good account of theſe particulars, by the procuration of the ſaid M. *Paiſen*, who preſented me at his departure with a copy of the diſputation he held at *Leyden*, *pro gradu*, *de humorum vitiis*, *eorumque reſtitutione*; wherein I meet with things that pleaſe me not a little.

I AM obliged to write very ſhortly to M. *Sluſius*, to return him thanks for his communications, and to give him an account of ſome things he deſired to be informed about. I am ſorry, I am not like to make your deſigned queries about the mines of his country one of the ingredients of my letter.

MR. *Colepreſſe* is gone, I think, by this time to *Holland*. In his laſt letter he relates, that lately pleaſuring a perſon of honour, by compoſing a barometer and ſome thermometers for him, he met with a pleaſing obſervation, relating to your experiments of the nephritick wood in Hiſtory of Colours; where ſpirit of vinegar is inſtanced for deſtroying of blue colour; but, contrary to his expectation, brandy did the work, and ſpirit of harts-horn recovered it again. He inſerts in the ſame letter ſome obſervations made about apple-trees, and for preſerving young fruit; as alſo ſome odd relations concerning a ternary and quaternary of teſticles found in father and ſon, and odd monſtroſities in that country, and unuſual peculiarities of nature in ſome perſons there, which would be too long and tedious to tranſcribe. I reſerve them till your happy return, which, I hope, will now be ſo very ſhortly, that by your next you will forbid me writing any more.

I HAVE made ſeveral applications about the Engliſh Hamburgh merchants charter; and am now promiſed to have a ſight of it to morrow, and I hope alſo permiſſion to make an extract out of it.

THE French letters do ſtill aſſure me of the encouragements, which their philoſophers receive for experiments. They have lately diſſected at *Caen* a Macreuſe, whereof they relate ſeveral particulars, to be imparted, when you ſhall be here.

FOR ſtate-news they write thus:

On ne parle plus que de guerre. Les gardes ſont deſia parties; le roy s'en ira à la fin du mois (Avril) cependant on ne laiſſe pas de negotier. Le bruit court, que les vaiſſeaux de D. Jean ont eſté diſſipez par la tempeſte. Cette nouvelle à beſoin de confirmation. Les Hollandois ſe preparent, et ſont tout ce qu'ils peuvent pour detourner la guerre de leur frontiere, et pour conſerver les places des Eſpagnols, qui ſont dans leur voiſinage. La Suede offre 12000 *hommes à ceux, qui ſe ſont ligués enſemble contre nous, moiennant* 60,000 *eſcus par mois. Vous ne manquerez pas de voſtre coſté de contribuer, comme les autres, par mer et par terre, et ainſi la guerre ſe fera tout de bon. Avec tout cela, l'armee de France eſt forte, et le roy à deux generaux, qui n'ont pas leurs pareils dans l'Europe. Il n'y à que Monſieur Wrangel, qui leur puiſſe eſtre comparé. D. Jean n' à pas aſſez d'experience pour reſiſter à deux capitaines conſommés comme eux. Il y à bien de l'apparence, que le roy ſera encore maitre de la campagne; mais il aura plus de peine que l'année paſſée. Les Suiſſes ſont mal contents, mais on les conte pour rien. L'empire ſera ſpectateur de la tragedie. L'empereur ne dit mot; mais on croit pourtant, que ſoubs main il agit auſſi. Le temps nous decouvrira bien des choſes. Dieu ſur tout.*

I HAVE not yet received Dr. *Needham*'s letter. I hope, I ſhall uſe it ſo, as may rather appeaſe, than exaſperate; who am,

SIR,

your very humble,

and faithful ſervant,

H. O.

OUR good friend Dr. *Beale* preſents his very humble ſervice to you with very affectionate expreſſions; and ſaith, that he utterly diſowns to have any power with M. *Glanvill* in his laſt writings, ſince he wrote againſt dogmatiſing.

London, April 14, 1668.

SIR,

THE foſſils, moſt to be met with in the country of *Liege*, are cadmia, alum, chalcanthum viride, ferrum, plumbum, and ſtibium, but mixed with much lead: it abounds alſo with marl, chalk-ſtones, pit-coal; which latter are of two ſorts, one catcheth fire eaſily, and by a kind of melting ſhews to hold ſtore of bitumen; the other, taking fire and conſuming more ſlowly, melteth not at all, and hath a ſulphureous ſmell. There are alſo marble, and tranſparent ſtones, both white and amethyſtin; and ſeveral Spaw-waters, not uſed by reaſon of the want of convenient lodgings, yet of no leſs virtue than thoſe that are.

DR. *Needham*'s letter is indeed material, and ſuggeſts ſeveral good experiments, which will invite me to preſent it to the Society, if M. *Hook*, whom I intend to ſhew it firſt, ſhall not earneſtly expreſs himſelf to be concerned for the not doing it. It ſeems, that I am by him thought guilty of having miſtaken his notion of ſanguification; which, I confeſs, I cannot well ſee, when I compare, the ſecond time, my expreſſions of p. 516. with his p. 172. 173.

I THINK, it is not any matter of doubt, whether your notes and ſuggeſtions about experiments of reſpiration will be welcome to the Society; nay, I am ſure, they will be

both ſerviceable and pleaſing to them; and I ſhall take care, that they be kept from being publiſhed any other way, than you take or order to be taken yourſelf.

ALL your experiments concerning the light in ſhining wood and fiſh, and the effects of air on them (which you enriched the Tranſactions with) the French have taken into their laſt journal, which is, in the greateſt part of it, made up of them, done handſomly enough, and with taking due notice of the worth of their author. This you will ſee at their return, among other things; of which Sir *R. Southwell*'s collections in *Portugal*, both as to written accounts, and divers curioſities, will make no ſmall part.

I CANNOT yet give you any account of the Hamburgh merchants charter, becauſe the perſon, I engaged in it, has not yet performed his word; which neglect is now ſo common, that it maketh a man altogether ſhy to promiſe any thing, wherein there is a dependance on another.

IT ſeems, it is certain, that a new comet hath been lately ſeen in other parts. From Dom. *Caſſini* at *Bononia* came to me this account:

A. 1668. *d.* 10. *Martii h.* 1. *noctis ſequent. obſervavi lucis ſemitam, à ceto per Eridanum extenſam, quam cometæ caudam judicavi tum ex figura et colore, tum quòd ejus directio, imaginatione continuata, producere videret ad gr.* 21. *piſcium, ubi tunc ſol erat, & proinde in partem ſibi oppoſitam vergeret, more aliorum cometarum. Apice pertingebat ad ſtellam in Eridano, quæ* 14. *dicitur à Bayerio. Egrediebatur autem è nubibus horizontalibus, ita ut cenſerem, cometæ caput vel iiſdem condi, vel infra horizontem latere. Sequebatur motum diurnæ revolutionis ad occaſum, conſpicique potuit ad hor.* 2. *noctis; tunc verò inter horizontales nebulas demerſa eſt.*

D. 11. *veſpere, apparuit inter nubes horizontis humidiores poſt hor.* 1. *noctis.*

D. 12. *veſperi, nubes humiliores partem cœli occidentalem occupabant, cumque cœlum mediaret Sirius, apparuit rurſus eadem cauda. Tranſibat per ſtellam in Eridano,* 14. *Bayero, relinquebatque ad auſtrum* 14. *ad quam d.* 10. *terminabatur, producebaturque ulterius.*

Ad tres circiter gradus, ulteriuſque per imaginationem producta, mediante filo, arcu tenſo, dirigebatur ad auſtraliorem in præcedente auriculam leporis: ſeptentrionalior igitur erat, quàm nudius tertius, & orientalior, pariterque in plagam ſoli oppoſitam vergebat.

Ad occidentem ejus regreſſio erat è nubibus; itaque utrum ab iis occultaretur caput cometæ, an infra horizontem lateret, incertum; linea autem à Jove ad terminum caudæ in nubibus erat ipſi caudæ perpendicularis. Erat igitur in ceto, & caudæ pars apparens protendebat grad. 32. *circiter.*

THE ſtone, I think, I formerly mentioned to have been taken out of a horſe at *Paris* (of four pound four ounces and an half weight) was found in a fatty membrane over againſt the kidneys, faſtned in two places to the ſpine; and had ſuch a poliſh, that it reflected images.

I RECOMMEND the incloſed to the care of your ſervant for Dr. *Needham*, and remain,

SIR,

your very humble and

faithful ſervant,

H. OLDENBURG.

London, July 27, 1668.

SIR,

THE incloſed from monſieur *Paiſen* came to my hands on Saturday laſt, under a cover of the ſame perſon to myſelf, together with a letter from monſieur *Fogel*, at *Hamburgh* (one of the diſciples of the famous *Jungius*) who tells me of the pains he taketh, in promoting the publication of the manuſcripts of that learned man; and in particular his *Phoranomica, Hiſtoria Inſectorum, Hiſtoria Naturalis ſimilarium Corporum, Hiſtoria Plantarum, & ad eam Iſagoge Phytoſcopica*, and then his *Apollonius Saxonicus*. But he complains of the great want of patrons to encourage and aſſiſt in that work, and of the difficulty of getting ſcholars to labour in the digeſting and tranſcribing of thoſe papers; uſing theſe words:

Cùm nobis deſint præmia philoſophica, adoleſcentes noſtri omnes properant ad facultates, quas vocant, lucroſas, theologiam puta juris prudentiam & medicinam, philoſophiæ ſtudio planè neglecto.

I HAD uſed ſome words in my letter to him, preſſing my wiſhes for the erecting of an experimental ſociety of philoſophers in *Germany*. To that he anſwers: *Perſuaſiſſimum tibi habe, vix aliquem mortalium tam impensè deſiderare ſimilem cœtum in Germania, quàm meipſum. Et jam pluſculi anni ſunt, quod de erigenda tali ſocietate laboraverim. Imò cùm Romæ viverem, collegi inſignem Lynceorum hiſtoriam, nunquam hactenus editam, cujus primus tomus, præter hiſtoriam Originis ejus, continet integrum Lynceographum principis Cæſii, in quo plura quæ ſocietati veſtræ utilia eſſe poſſunt. Sed cùm veſtra ſocietas ditiſſimis abundet patronis* (This is *fallacia compoſitionis & diviſionis*; there are amongſt us many, that are rich enough; but where are the rich patrons?) *& legatum ſuum rex Angliæ hac in urbe alat, nunquid hic ſperari poterit fundatio alicujus collegii parvi, quod à majori veſtro dependeat? Hoc olim erat ſocietatis principis Cæſii inſtitutum, habere ſc. in Italia, Germania, Gallia, Polonia, &c. varia collegia, quæ à ſe, Romano principe, dependerent.*

WHAT an honour would that be for *England*, if, when foreign nations ſhould offer to enter into ſuch learned ſocieties, and they depend from the Royal they might receive encouragement from hence? But it were vanity, to flatter one's ſelf with ſuch hopes.

I INTEND, God willing, very ſhortly to return an anſwer both to M. *Paiſen* and M. *Fogel*; and if you pleaſe, Sir, to have ſome-

thing of yours conveyed in the ſame packet, I ſhall take the ſame care of it, I do of my own.

I HAVE heard nothing from *Oxford* concerning the printing of the Latin Hydroſtaticks, nor the continuation of the Pneumatick Experiments; nor is Mr. *Crook* forward in printing the Latin Hiſtory of Cold; yet he promiſes, that between this and Michaelmas it ſhall be done.

AT *Paris* the philoſophers are buſy in diſſections; and ſo they are at *Caen*, where chiefly they anatomiſe fiſhes; among which, they have lately diſſected a ſturgeon, whereof I have a large account, too long to be inſerted here. They are examining more and more the circulation in plants; and ſay, *Qu'il faut placer le centre de la circulation des plantes à l'endroit, où s'aſſemblent les branches de la racine, qui eſt juſtement l'endroit le premier formé: car coupez le tronc de l'arbre juſques aupres de la terre, il repouſſera des branches; coupez les racines, ſi le tronc des racines demeure entier, l'arbre ne mourra point, mais coupez cette partie, toute la plante mourra infalliblement. C'eſt donc là proprement qu'il faut placer le principe de la circulation.*

AT our Society, we are ſtill upon the mixing of different bodies, and of incorporating them into one another, to explore the weight of the total, and of the ingredient parts. We have alſo begun to examine the life of birds in free and compreſſed air: and for the trial of the duration of their life in free air, we take birds of the ſame kind, and put them up in cloſe veſſels of differing capacities; to ſee, what proportion the duration of their life holds to the quantity of common, though cloſe air, they live in. Lately we fell upon the examination of pendulums, which was occaſioned by a propoſition advanced by *Borelli de vi percuſſionis*, who ſeems to aſſert; "That "the line of a pendulum being ſtopped by "a pin or other thing in the perpendicular "line any where, the bullet holds on its mo- "tion beyond the perpendicular (though in "another circle) to near the altitude of the "ſame horizontal line, from whence it fell, "decreaſing after the ſame velocity, in which "it before accelerated, *viz.* moving like "ſpaces in proportionable times, accounted "from the perpendicular each way, where "the two circles unite." Some of our Society judge it to be true, and are labouring to find the demonſtration for it.

SIR, this was accompanied with the *Unum Neceſſarium* of honeſt *Comenius*. I can gueſs, what will be thought of it and the preface. Oblige me, I pray, to preſent my very humble ſervice to my lady *Ranelagh*, and all the other noble company, where now you are.

SIR,

your very humble ſervant,

H. O.

PARDON my haſty ſcribble.

London, July 10, 1674.

SIR,

I HEREWITH take the liberty of ſending you my tract of June, which, I hear my lord chief juſtice *Hale* ſent for, almoſt as ſoon as it was out of the preſs, and at which, I think, he cannot juſtly be offended in reference to what concerns him, though ſome inconſiderate men give out, that he will upon occaſion reſent the non-acknowledgment of greater worth in his book; which humour I can hardly think ſuch a man capable of.

CONCERNING Dr. *Coxe*'s diſcourſe, though I did once intend to take notice in theſe papers of the concurrence of your thoughts with his in ſome particulars; yet upon hearing you ſay, when I mentioned it to you, that you conceived he did not interfere with you in theſe obſervations, I altered my purpoſe. Mean time, I have delivered your papers about the hidden qualities of the air to Mr. *Pitt*, who ſaith, he will get them printed with all convenient ſpeed, and hopes as well as I, you will find ſome other ſuitable ſubject to join with that, and thereby to give the book a juſter bulk.

I HEAR ſome very learned and knowing men ſpeak very ſlightly of the *quinque Tractatus* of *J. M.* and a particular friend of yours and mine told me yeſterday, that as far as he had read him, he would ſhew to any impartial and conſidering man more errors than one in every page.

SIR, there is come to my hands ſince you left *London*, but little philoſophical news from abroad. My lord *Herbert* writes me from *Blois*, that a phyſician of *Aix* in *Provence* hath promiſed to indicate an herb to him, by the juice of which a man's hand dipped in molten lead ſhall not be burnt, nor ſcarce feel any conſiderable heat.

MONSIEUR *Auzout* writes thus from *Rome*; *Que les cheveux ſont crûs de la moitié d'un doigt à un criminel, à qui on à donne la Veglia, quil à ſoufferte 12 heures. C'eſt une eſpece de queſtion fort douleureuſe. On à remarqué, que les patients ſuent quelquefois de telle ſorte, que l'eau coule de leur corps comme un ruiſſeau, et qu'ils enflent par tout le corps apres un certain temps.*

MONSIEUR *Juſtel* relates in his laſt letter to me; *Qu'il y à Paris un gentilhomme, qui, apres une grande colique, à jetté pars les ſelles un animal fait comme un poiſſon, qui eſt en petit de la forme d'un Dauphin, une matiere qui eſt comme une pierre et du bois; et qu'il y avoit auſſi du pourpier, et du cerfeuil et des mouches. Il ſouffre de grandes douleurs, et continue à vuider ces ſortes de matieres là. Les medicins ne ſcavent qu'en dire, et ſont ſurpris de cette avanture. Ce mal l'a pris à Bezancon, et à continué juſques à preſent.*

THE political news, he adds, are theſe: *Les Hollandois ſe ſont retirez de Belle Iſle ſans rien faire. M. de Turenne à repaſſé le Rhin pour aller combatre les ennemis. M. le Conte de Tot eſt icy, ce qui fait eſperer, que le traitté de paix ſe pourra renouër, quoy qu'il y ait peu d'apparence. Les Allemands ſont tousjours ſur la Meuſe. Ap-*

paremment

paremment ils ne feront pas plus de choſes que les Hollandois. On à eſcrit de Suratte, que M. de la Haye, qui eſt à St. Thomé, à defait dix mille Indiens avec 500 *hommes, et brulé Maſulipatan: ce qui à beſoin de confirmation.*

THE news come from *Windſor*, is, that the French king hath written to our king, that M. *de Turenne*, in a ſecond fight, hath quite routed the Lorainer and his adherents. But other letters affirm, that the Germans being in march againſt *Turenne*, and he hearing of it, marched with all diligence to meet them; and having ſurpriſed them by appearing in battalia and good order, when they were not ready, cauſed them to retreat; whereupon he was encouraged to follow them, cutting off a conſiderable number of their rear, and taking five or ſix pieces of cannon, and purſuing them to the very gates of *Franckfort*; and now threatning to beſiege either *Heidelberg* or *Frankendal.* Unfortunate country!

Extract out of Mr. Newton's *letter written to* H. O. *from* Cambridge. *April* 26, 1676.

YESTERDAY reading the two laſt Philoſophical Tranſactions, I had the opportunity to conſider *R. B.*'s uncommon experiment about the incaleſcence of ☉ and ☿. I believe the fingers of many will itch to be at the knowledge of the preparation of ſuch a ☿; and for that end, ſome will not be wanting to move for the publiſhing of it, by urging the good it may do in the world. But in my ſimple judgment the noble author, ſince he hath thought fit to reveal himſelf ſo far, does prudently in being reſerved in the reſt. Not that I think any great excellence in ſuch a ☿, either for medical or chemical operations; for, it ſeems to me, that the metalline particles, with which that ☿ is impregnated may be groſſer than the particles of the ☿, and be diſpoſed to mix more readily with the ☉ upon ſome other account than their ſubtilty; and then in ſo mixing their groſſneſs may enable them to give the parts of the gold the greater ſhock, and ſo put them into a briſker motion than ſmaller particles could do: much after the manner, that the ſaline particles, wherewith corroſive liquors are impregnated, heat many things, which they are put to diſſolve, whilſt the finer parts of common water ſcarce heat any thing diſſovled therein, be the diſſolution never ſo quick; and if they do heat any thing, (as quick lime) one may ſuſpect, that heat is produced by ſome ſaline particles lying hid in the body, which the water ſets on work upon the body, which they could not act on whilſt in a dry form. I would compare therefore this impregnated ☿ to ſome corroſive liquor, (as aqua fortis) the mercurial part of the one to the watry or phlegmatick part of the other, and the metallick particles, with which the one is impregnated, to the ſaline particles, with which the other is impregnated; both which I ſuppoſe may be of a middle nature between the liquor, which they impregnate, and the bodies they diſſolve, and ſo enter thoſe bodies more freely, and by their groſſneſs ſhake the diſſolved particles more ſtrongly, than a ſubtler agent would do. If this analogy of theſe two kinds of liquors may be allowed, one may gueſs at the little uſe of the one by the indiſpoſition of the other, either to medicine or vegetation. But yet, becauſe the way, by which ☿ may be ſo impregnated, hath been thought fit to be concealed by others, that have known it, and therefore may poſſibly be an inlet to ſomething more noble, not to be communicated without conſiderable damage to the world, if there ſhould be any verity in the hermetick writers; therefore I queſtion not, but that the great wiſdom of the noble author will ſway him to ſilence, till he ſhall be reſolved of what conſequence the thing may be, either by his own experience, or the judgment of ſome other, that thoroughly underſtands what he ſpeaks about, that is, of a true hermetick philoſopher, whoſe judgment (if there be any ſuch) would be more regarded in this point, than that of all the world beſides to the contrary, there being other things beſides the tranſmutation of metals (if thoſe great pretenders brag not) which none but they underſtand. Sir, becauſe the author ſeems deſirous of the ſenſe of others in this point, I have been ſo free as to ſhoot my bolt.

Crayford in *Kent*, Sept. 19, 1676.

SIR,

SINCE the trouble, ſtill given me by my tenant, will not ſuffer me to return with my family to *London* on the day mentioned to you, I thought to let you know ſo much by theſe lines, and withall to aſſure you, that the verſion of your book into Latin doth go on here as well as if I were in town. I wiſh only, that Mr. *Pitt* be as ready to print, as I intend to be, God willing, to deliver him copy. If it be poſſible, we ſhall be all at *London* on Tueſday or Wedneſday of the next week. I pray, Sir, to let little *Tom* carry the encloſed to my houſe, and to tell the maid, ſhe muſt deliver the letter he carries to her, to her brother immediately, the matter requiring haſte. Almighty God bleſs you, and confirm your health for many years, for the publick good, and the particular concern and joy of,

SIR,

your very humble

and faithful ſervant,

H. OLDENBURG.

Noble

Letters from John Evelyn *Eſq; to Mr.* Boyle.

Say's-Court, May 9, 1657.

Noble Sir,

I SHOULD infinitely bluſh at the ſlowneſs of this addreſs, if a great indiſpoſition of body, which obliged me to a courſe of phyſick, and ſince, an unexpected journey (from both which I am but lately delivered) had not immediately intervened, ſince you were pleaſed to command theſe trifles of me. I have omitted thoſe of braſs, *&c.* becauſe they properly belong to etching, and ingraining, which treatiſe, with five other, (*viz.* painting in oil, in miniature, ancaling in glaſs, enamelling, and marble paper) I was once minded to publiſh (as a ſpecimen of what might be farther done in the reſt) for the benefit of the ingenious. But I have ſince been put off from that deſign, not knowing, whether I ſhould do well to gratify ſo barbarous an age (as I fear is approaching) with curioſities of that nature, delivered with ſo much integrity as I intended them; and, leſt by it I ſhould alſo diſoblige ſome, who make thoſe profeſſions their living; or, at leaſt, debaſe much of their eſteem by proſtituting them to the vulgar. Rather, I conceived, that a true and ingenuous diſcovery of thoſe, and the like arts, would, to better purpoſe, be compiled for the uſe of that mathematico-chymico-mechanical ſchool, deſigned by our noble friend Dr. *Wilkinſon*; where they might (not without an oath of ſecrecy) be taught to thoſe, that either affected, or deſired any of them; and from thence (as from another *Solomon*'s houſe) ſo much of them made publick, as ſhould, from time to time, be judged convenient by the ſuperintendent of that ſchool, for the reputation of learning, and benefit of the nation: and, upon this ſcore, there would be a moſt willing contribution of what ingenious perſons know of this kind; and, to which, I ſhould moſt freely dedicate what I have. In the mean time, Sir, I tranſmit you this varniſh; and ſhall eſteem myſelf extremely honoured, that you will farther command whatſoever elſe of this, or any other kind, is in the power of,

SIR,

your moſt humble, and
moſt obedient ſervant,

EVELYN.

I BESEECH you, Sir, to make my moſt humble ſervice acceptable to Dr. *Wilkinſon*; and that you be pleaſed to communicate to me, what ſucceſs you have, in the proceſs of this receipt (myſelf not having had time to examine it) that in caſe of any difficulty, I may have recourſe to the perſon from whom I received it.

Say's-Court, Aug. 9, 1659.

Honoured Sir,

I AM perfectly aſhamed at the remiſſneſs of this recognition for your late favours from *Oxon:* where (though had you reſided) it ſhould have interrupted you before this time. It was by our common and good friend Mr. *Hartlib*, that I come now to know you are retired from thence; but not from the muſes, and the purſuit of your worthy deſigns, the reſult whereof we thirſt after with all impatience; and how fortunate ſhould I eſteem myſelf, if it were in my power to contribute in the leaſt to that, which I augure of ſo great and univerſal a benefit! But, ſo it is, that my late inactivity has made ſo ſmall a progreſs, that, in the Hiſtory of Trades, I am not advanced a ſtep; finding (to my infinite grief) my great imperfections for the attempt, and the many ſubjections, which I cannot ſupport, of converſing with mechanical capricious perſons, and ſeveral other diſcouragements; ſo that, giving over a deſign of that magnitude, I am ready to acknowledge my fault, if from any expreſſion of mine, there was any room to hope for ſuch a production, farther than by a ſhort collection of ſome heads and materials, and a continual propenſity of endeavouring in ſome particular, to encourage ſo noble a work, as far as I am able, a ſpecimen whereof I have tranſmitted to Mr. *Hartlib*, concerning the ornaments of gardens, which I have requeſted him to communicate to you, as one, from whom I hope to receive my beſt, and moſt conſiderable furniture; which favour, I do again and again humbly ſupplicate; and, eſpecially, touching the firſt chapter of the third book, the eleventh and twelfth of the firſt; and, indeed, on every particular of the whole. Sir, I thank you for your receipts: there is no danger I ſhould proſtitute them, having encountred in books, what will ſufficiently (I hope) gratify the curioſity of moſt, when in my third I ſpeak of the elaboratory. But I remit you to what I have written to Mr. *Hartlib*, and begging pardon for this preſumption, crave leave to remain,

SIR,

your moſt humble,

and obedient ſervant,

EVELYN.

SIR, do you know, whether *Campanella* has ſaid any thing concerning altering the ſhape of fruits, *&c.* and how I may obtain the peruſal of *Benedicti Curtii Hortorum Lib.* 30. *Lugd.* 1560. *fol.?*

Say's-Court, Sept. 3, 1659.

Noble Sir,

TOGETHER with theſe teſtimonies of my chearful obedience to your commands, and a faithful promiſe of tranſmitting the reſt, if yet there remain any thing worthy your acceptance amongſt my unpoliſhed and ſcattered collections, I do here make bold to trouble you with a more minute diſcovery of the deſign, which I caſually mentioned to you, concerning my great inclina-

tion to redeem the remainder of my time, conſidering, *quam parum mihi ſuperſit ad metas*; ſo as may beſt improve it to the glory of God Almighty, and the benefit of others. And, ſince it has proved impoſſible for me to attain to it hitherto (though in this my private and mean ſtation) by reaſon of that fond morigeration to the miſtaken cuſtoms of the age, which not only rob men of their time, but extremely of their virtue and beſt advantages; I have eſtabliſhed with my ſelf, that it is not to be hoped for, without ſome reſolutions of quitting theſe incumbrances, and inſtituting ſuch a manner of life, for the future, as may beſt conduce to a deſign ſo much breathed after, and, I think, ſo advantageous. In order to this, I propound, that ſince we are not to hope for a mathematical college, much leſs, a *Solomon*'s houſe, hardly a friend in this ſad *Cataſyſis*, and *inter hos armorum ſtrepitus*, a period ſo uncharitable and perverſe; why might not ſome gentlemen, whoſe geniuſes are greatly ſuitable, and who deſire nothing more than to give a good example, preſerve ſcience, and cultivate themſelves, join together in ſociety, and reſolve upon ſome orders and oeconomy, to be mutually obſerved, ſuch as ſhall beſt become the end of their union, if, I cannot ſay, without a kind of ſingularity, becauſe the thing is new; yet ſuch at leaſt, as ſhall be free from pedantry, and all affectation? The poſſibility, Sir, of this is ſo obvious, that I profeſs, were I not an aggregate perſon, and ſo obliged, as well by my own nature, as the laws of decency, and their merits, to provide for my dependents, I would chearfully devote my ſmall fortune towards a deſign, by which I might hope, to aſſemble ſome ſmall number together, who would reſign themſelves to live profitably and ſweetly together. But ſince I am unworthy ſo great a happineſs, and that it is not now in my power; I propoſe, that, if any one worthy perſon, and *queis meliore luto*, ſo qualified as Mr. *Boyle*, will join in the deſign (for not with every one, rich, and learned, there are very few diſpoſed, and it is the greateſt difficulty to find the man) we would not doubt, in a ſhort time (by God's aſſiſtance) to be poſſeſſed of the moſt bleſſed life, that virtuous perſons could wiſh or aſpire to in this miſerable and uncertain pilgrimage, whether conſidered, as to the preſent revolutions, or what may happen for the future in all human probability. Now, Sir, in what inſtances, and how far this is practicable, permit me to give you an account of, by the calculations, which I have deduced for our little foundation.

I PROPOSE the purchaſing of thirty or forty acres of land, in ſome healthy place, not above twenty five miles from *London*; of which a good part ſhould be tall wood, and the reſt upland paſtures, or downs, ſweetly irrigated. If there were not already an houſe, which might be converted, *&c.* we would erect upon the moſt convenient ſite of this, near the wood, our building, *viz.* one handſome pavilion, containing a refectory, library, withdrawing room and a cloſet; this the firſt ſtory; for we ſuppoſe the kitchen, larders, cellars and offices to be contrived in the half ſtory under ground. In the ſecond ſhould be a fair lodging chamber, a pallet-room, gallery and a cloſet; all which ſhould be well and very nobly furniſhed, for any worthy perſon, that might deſire to ſtay any time, and for the reputation of the college. The half ſtory above for ſervants, wardrobes, and like conveniencies. To the entry fore front of this a court; and at the other back front a plot walled in of a competent ſquare, for the common ſeraglio, diſpoſed into a garden; or it might be only carpet, kept curiouſly, and to ſerve for bowls, walking, or other recreations, *&c.* if the company pleaſe. Oppoſite to the houſe, towards the wood, ſhould be erected a pretty chapel; and at equal diſtances (even with the flanking walls of the ſquare) ſix apartments or cells, for the members of the Society, and not contiguous to the pavilion, each whereof, ſhould contain a ſmall bedchamber, an outward room, a cloſet, and a private garden, ſomewhat after the manner of the Carthuſians. There ſhould likewiſe be an elaboratory, with a repoſitory for rarities and things of nature; aviary, dove-houſe, phyſick-garden, kitchen-garden, and a plantation of orchard fruit, *&c.* all uniform buildings, but of ſingle ſtories, or a little elevated. At convenient diſtance towards the olitory garden ſhould be a ſtable for two or three horſes, and a lodging for a ſervant or two. Laſtly a garden-houſe and conſervatory for tender plants.

THE eſtimate amounts thus. The pavilion 400 l. chapel 150 l. apartments, walls, and out-houſing 600 l. The purchaſe of the fee for thirty acres, at 15 l. per acre, eighteen years purchaſe, 400 l. The total, 1550 l. 1600 l. will be the utmoſt.

THREE of the cells or apartments, that is, one moiety, with the appertenances, ſhall be at the diſpoſal of one of the founders, and the other half at the other's.

IF I and my wife take up two apartments (for we are to be decently aſunder, however I ſtipulate, and her inclination will greatly ſuit with it, that ſhall be no impediment to the Society, but a conſiderable advantage to the oeconomick part) a third ſhall be for ſome worthy perſon; and to facilitate the reſt, I offer to furniſh the whole pavilion compleatly, to the value of 500 l. in goods and moveables, if need be, for ſeven years, till there be a publick ſtock, *&c.*

THERE ſhall be maintained, at the publick charge, only a chaplain, well qualified, an ancient woman, to dreſs the meat, waſh and do all ſuch offices; a man to buy proviſions, keep the garden, horſes, *&c.* a boy to aſſiſt him, and ſerve within.

AT one meal a day, of two diſhes only (unleſs ſome little extraordinary upon particular days, or occaſions, then, never exceeding three) of plain and wholeſom meat; a ſmall refection at night: wine, beer, ſugar, ſpice, bread, fiſh, fowl, candle, ſoap, oats, hay, fuel, *&c.* at 4 l. per week, 200 l. per ann. wages 15 l. keeping the gardens 20 l. the chaplain 20 l. per ann. Laid up in the treaſu-

ry yearly 145 l. to be employed for books, inſtruments, drugs, trials, *&c.* The total 400 l. a year, comprehending the keeping of two horſes for the chariot, or the ſaddle, and two kine: ſo that 200 l. per ann. will be the utmoſt, that the founders ſhall be at, to maintain the whole Society, conſiſting of nine perſons (the ſervants included) though there ſhould no others join, capable to alleviate the expence: but if any of thoſe, who deſire to be of the Society, be ſo qualified, as to ſupport their own particulars, and allow for their proportion, it will yet much diminiſh the charge; and of ſuch there cannot want ſome at all times, as the apartments are empty.

IF either of the founders thinks expedient to alter his condition; or that any thing do *humanitus contingere*, he may reſign to another, or ſell to his collegue, and diſpoſe of it as he pleaſes; yet ſo as it ſtill continue the inſtitution.

ORDERS.

AT ſix in ſummer prayers in the chapel. To ſtudy till half an hour after eleven. Dinner in the refectory till one. Retire till four. Then called to converſation (if the weather invite) abroad, elſe, in the refectory. This, never omitted, but in caſe of ſickneſs. Prayers at ſeven. To bed at nine. In the winter, the ſame, with ſome abatements for the hours; becauſe the nights are tedious, and the evenings converſation more agreeable. This in the refectory. All play interdicted, *ſans bowls, cheſs, &c.* Every one to cultivate his own garden. One month in ſpring a courſe in the elaboratory on vegetables, *&c.* In the winter a month on other experiments. Every man to have a key of the elaboratory, pavilion, library, repoſitory, *&c.* Weekly faſt. Communion once every fortnight, or month at leaſt. No ſtranger eaſily admitted to viſit any of the Society, but upon certain days weekly, and that only after dinner. Any of the Society may have his commons to his apartment, if he will not meet in the refectory, ſo it be not above twice a week. Every Thurſday ſhall be a muſick meeting at converſation hours. Every perſon of the Society ſhall render ſome publick account of his ſtudies weekly, if thought fit, and eſpecially ſhall be recommended the promotion of experimental knowledge, as the principal end of the inſtitution. There ſhall be a decent habit and uniform uſed in the college. One month in the year may be ſpent in *London*, or any the univerſities, or in a perambulation for the publick benefit, *&c.* with what other orders ſhall be thought convenient, *&c.*

THUS, Sir, I have in haſte (but to your loſs not in a Laconic ſtile) preſumed to communicate to you (and truly, in my life, never to any but yourſelf) that project, which for ſome time has traverſed my thoughts; and therefore, far from being the effect either of an impertinent or trifling ſpirit, but the reſult of mature and frequent reaſonings. And, Sir, is not this the ſame, that many noble perſonages did at the confuſion of the empire by the barbarous Goths, when St. *Hierome*, *Euſtochium*, and others, retired from the impertinencies of the world to the ſweet receſſes and ſocieties in the eaſt, till it came to be burthened with the vows and ſuperſtitions, which can give no ſcandal to our deſign, that provides againſt all ſuch ſnares?

Now to aſſure you, Sir, how pure and immixed the deſign is from any other than the publick intereſt, propounded by me, and to redeem the time to the nobleſt purpoſes; I am thankfully to acknowledge, that, as to the common forms of living in the world, I have little reaſon to be diſpleaſed at my preſent condition; in which, I bleſs God, I want nothing conducing either to health, or honeſt diverſion, extremely beyond my merit; and therefore, would I be ſomewhat choice and ſcrupulous in my collegue; becauſe he is to be the moſt dear perſon to me in the world. But oh! how I ſhould think it deſigned from heaven, and *tanquam numen* διοπετὲς, did ſuch a perſon as Mr. *Boyle*, who is alone a ſociety of all that were deſirable to a conſummate felicity, eſteem it a deſign worthy his embracing! Upon ſuch an occaſion, how would I proſtitute all my other concernments! how would I exult! and, as I am, continue, upon infinite accumulations and regards,

SIR,

his moſt humble, and

moſt obedient ſervant,

EVELYN.

IF my health permit me the honour to pay my reſpects to you, before you leave the town, it will bring you a rude plot of the building, which will better fix the idea, and ſhew what ſymmetry it holds with this deſcription.

Say's-Court, Sept. 29, 1659.

SIR,

I SEND you this encloſed, the product of your commands, but the leaſt inſtance of my ambition to ſerve you: and when I ſhall add, that if an oblation of whatever elſe I poſſeſs, can verify the expreſſion of my greater eſteem of your incomparable book; which, as indicted with a pen ſnatched from the wing of a ſeraphim, exalts your divine incentives to that height, that being ſometimes raviſhed with your deſcription of that tranſcendent ſtate of angelical amours, I was almoſt reconciled to the paſſion of *Cleombrotus*, who threw himſelf into the water upon the reading of *Plato*; and (as deſpairing to enjoy it) ready to cry out with St. *Paul, cupio diſſolvi*, and to be in the embraces of this ſeraphick love, which you have deſcribed to that perfection, as if in the company of ſome celeſtial harbinger, you had taken flight, and been raviſhed into the third heaven, where you have heard words unutterable, and, from whence, you bring us ſuch affections and divine inclinations, as are only competent to angels and to yourſelf: for ſo powerful is your eloquence,

eloquence, ſo metaphyſical your diſcourſe, and ſublime your ſubject. And though by all this, and your rare example, you civilly declaim againſt the miſtakes we married perſons uſually make; yet I cannot think it a paralogiſm or inſidious reaſoning, which you manage with ſo much ingenuity, and purſue with ſo great judgment. But certainly it was an extraordinary grace, that at ſo early years, and amidſt the ardours of youth, you ſhould be able to diſcern ſo maturely, and determine ſo happily; avoid the Syren, and eſcape the tempeſt: but thus, when the curioſity of *Pſyche* had lighted the taper, and was reſolved to ſee what ſo ardently embraced her, ſhe diſcovered an impertinent child, the weakneſs and folly of the paſſion. You, Sir, found its imperfections betimes; and that men then ceaſed to be wiſe, when they began to be in love, unleſs, with you, they could turn nature into grace, and, at once, place their affections on the right object. But, Sir, though you ſeem tender of the conſequence all this while, the concluſion will ſpeak as well as your example; that though you have ſaid nothing of marriage, which is the reſult of love; yet you ſuppoſe, that it were hard to become a ſervant without folly; and that there are ten thouſand inquietudes eſpouſed with a miſtreſs. That the fruits of children are tears and weakneſs, whilſt the productions of the ſpirit put their parents neither to charge nor trouble; that all theſe heroes, of whom we read, eſteemed moſt precious of the celibate. *Alexander* had no child, and *Hercules* left no heir: *Pallas* was born of the brain of *Jupiter*; and the *Venus Urania* of the Platoniſts made love only to the ſoul, which ſhe united to the eſſence of God (according to their divinity) and had no lower commerce than what you ſo worthily celebrate in your book, and cultivate in your life. But though theſe were all true, and all that you have added, ſince I find the paſſion of *Lindamore* rather to be pitied, than criminal, becauſe *Hermione*'s was not reciprocal; though ſhe were cruel, the ſex is tender, and amiable; pious, and uſeful, and will never want champions to defend their virtues, and aſſert their dues, and that is our love and our ſervice. For if it be virtuous, it is the neareſt to the ſeraphical; and whatever can be objected againſt it, proceeds from the vices of the perſon's defect, or extremes of the paſſion. But you inſtance in the jealouſies, diſeaſes, follies, and inconſtancies of love: the ſenſual truly is obnoxious to all theſe; but who have been the martyrs, where the deſign was not plainly brutiſh, indifferent to the education, or blinded with avarice? And, if you have example of their hatred, and perfidy, I can produce a thouſand of their affection and integrity. What think you, Sir, of *Alceſte*, that ran into the funeral pile of her huſband? The goodneſs of *Æmilia*, the chaſtity of *Lucretia*, the faith of *Furia*, of *Portia*, and infinite others who knew nothing, that the Chriſtian inſtitution has ſuperadded? And the Scriptures are full of worthy examples, ſince it was from the effects of conjugal love, that the Saviour of the world, and that great object of ſeraphick love derived his incarnation, who was the ſon of *David*. Take away this love, and the whole earth is but a deſert; and though there were nothing more worthy eulogies than virginity, it is yet but the reſult of love, ſince thoſe, that ſhall people paradiſe, and fill heaven with ſaints, are ſuch, as have been ſubject to this paſſion, and were the products of it. In ſum, it is by that, the church has conſecrated to God both virgins and martyrs, and confeſſors theſe five thouſand years; and he that ſaid, it was not good for man to be alone, placed the celibate amongſt the inferior ſtates of perfection, whatſoever ſome affirm; ſeeing that of St. *Paul* is not general, and he confeſſes, he had no command from the Lord. It was the beſt advice in a time of perſecution, the preſent diſtreſs, and for an itinerant apoſtle; and truly it is what I ſo recommend to all of that function, that, for many regards, I could wiſh them all as ſeraphims, who do neither marry, nor are given in marriage. But, I cannot conſent, that ſuch a perſon as Mr. *Boyle* be ſo indifferent, decline a virtuous love, or imagine, that the beſt ideas are repreſented only in romances, where love begins, proceeds, and expires in the pretty tale, but leaves us no worthy impreſſions of its effects. We have nobler examples: and the wives of philoſophers, pious and ſtudious perſons, ſhall furniſh our inſtances: for ſuch was *Pudentilla*, that held the lamp to her huſband's lucubrations: ſuch a companion had the learned *Budæus*; and the late adventure of madam *Grotius*, celebrated by her *Hugo*, who has not heard of? We need not go abroad; the committee chambers, and the parliament lobby, are ſad, but evident teſtimonies of the patience, and the addreſs, the love, and the conſtancy of theſe gentle creatures. In fine, they bear us out of love, and they give us ſuch; they divert us when we are well, and tend us when we are ſick; they grieve over us when we die, and ſome, I have known, that would not be comforted and ſurvive. But, Sir, *Ludov. Vives* has written a volume on this ſubject, and taken all his hiſtories from the love of Chriſtian women. *Jacobus de Voragine* gives us twelve motives to acknowledge the good we receive by them, and I could add a thouſand more, were not that of *Pliny inſtar omnium*, who writing to his mother-in-law *Hiſpulla*, that brought his lady up, gives her this character. *Summum eſt acumen, ſumma frugalitas: amat me, quod caſtitatis indicium eſt. Accedit his ſtudium literarum, quod ex mei charitate concepit. Meos libellos habet, lectitat, ediſcit etiam. Qua illa ſolicitudine, quum videor acturus; quanto, quum egi, gaudio afficitur?* and a little after, *Verſus quidem meos cantat, formatque cithara, non artifice aliquo docente, ſed amore, qui magiſter eſt optimus:* whence he well foreſees, *perpetuam nobis majoremque indies futuram eſſe concordiam:* diſcourſing in that which follows, of the nobleneſs and purity of her affection, with this elegant and civil

acknowledg-

acknowledgment, *certatim ergo tibi gratias agimus: ego, quod illam mihi: illa, quod me ſibi dederis, quaſi invicem delegeris*. And what if Mr. *Boyle* himſelf did love ſuch a lady, *gratâ aliqua compede adſtrictus*, would it hinder him from the ſeraphick, or the purſuit of his worthy enquiries? There is no danger, that he ſhould be taught philoſophy as *Socrates* was, who already commands his paſſions, and has divinity ſufficient to render even *Zantippe* a ſaint; and whoſe arguments for the ſeraphick love would make all men to envy his condition, and ſuſpect their own, if it could once be admitted, that thoſe, who are given to be *auxilia commoda*, ſhould hinder them in the love of God, whereof marriage is a figure: for ſo the apoſtle makes the parallel, when he ſpeaks of the ſpouſe, *Epheſ.* v. and devotion is ſo generally conſpicuous in the female ſex, that they furniſh the greater part of many litanies, and, whom if we may not pray to, we ought certainly to praiſe God for; not ſo much becauſe they were virgins, as that they were the mothers and the daughters of the greateſt ſaints, and lights of the church, who propagated the ſeraphick love with their examples, and ſealed it with their blood. But, dear Sir, miſtake me not all this while, for I make not this recital, as finding the leaſt period in your moſt excellent diſcourſe prejudicial to the conjugal ſtate; or that I have the vanity to imagine my forces capable to render you a proſelyte of *Hymen*'s, who have already made the worthieſt choice; much leſs to magnify my own condition, and lay little ſnares for thoſe obvious replies, which return in compliments, and odious flatteries. I have never encountered any thing extraordinary, or dare lay claim to the leaſt of the virtues I have celebrated: but if I have found the converſation capable of exalting and improving our affections, even to the higheſt of objects, and to contribute very much to human felicity; I cannot pronounce the love of the ſex to be at all miſapplied, or to the prejudice of the moſt ſeraphical. And if to have the fruition and the knowledge of our friends in heaven, will be ſo conſiderable an augmentation of our felicity; how great is that of the married like to prove, ſince there is not on earth a friendſhip comparable to it? Or if paradiſe and the ark be the moſt adequate reſemblances of thoſe happy manſions, you may remember there were none but couples there, and that every creature was in love.

BUT why do I torment your eyes with theſe impertinencies! which would never have end, did I not conſider, I am but writing a letter, and how much bettet you are wont to place your precious hours. But, Sir, I have now but a word to add, and it is to tell you, that, if after all this, we acknowledge your victory, and find all our arguments too weak to conteſt with your ſeraphical object, pronounce you wiſe, and infinitely happy; yet, as if envying, that any elſe ſhould be ſo; you have too long concealed the diſcourſes, which ſhould have gained you diſciples, and are yet not afraid to make apologies for employing that talent, which you cannot juſtify the wrapping up all this while in a napkin. We therefore, that are entangled in our miſtakes, and acknowledge our imperfections, muſt needs declare againſt it, as the leaſt effects of a ſeraphick lover, which were to render all men like himſelf. And ſince there is now no other remedy, make the beſt uſe we can of, as St. *Paul* adviſes, *ut qui habent uxores, ſint tanquam non habentes, &c.* and for the reſt, to ſerve and to love God as well as we may in the condition we are aſſigned; which if it may not approach to the perfection of Seraphims, and that of Mr. *Boyle*, let it be as near as it can, and we ſhall not account ourſelves amongſt the moſt unhappy, for having made ſome virtuous addreſſes to that fair ſex.

DEAREST Sir, permit me to tell you, that I extremely loved you before; but my heart is infinitely knit to you now: for what are we now to expect from ſo timely a conſecration of your excellent abilities? The Primitiæ ſanctified the whole harveſt; and you have at once, by this incomparable piece, taken off the reproach, which lay upon piety, and the enquiries into nature; that the one was too early for younger perſons, and the other the ready way to atheiſm, than which, as nothing has been more impiouſly ſpoken, ſo, nor has any thing been more fully refuted. But, Sir, I have finiſhed; pardon this great exceſs; it is love, that conſtrains me, and the effects of your diſcourſes, from which I have learned ſo many excellent things, that they are not to be numbered and merited with leſs than I have ſaid, and than I profeſs, which is to continue all my life long,

SIR,

your moſt humble, obliged,

and moſt affectionate ſervant,

J. EVELYN.

Say's-Court, Sept. 13, 1661.

SIR,

I SEND you the receipt of the varniſh, and believe it to be very exact; becauſe it is ſo particular, and that I received it from the hand of a curious perſon, who, having made trial of it himſelf, affirms it to have ſucceeded. I ſend you alſo another trifle, which has a nearer relation to me; and you will eaſily pardon my indignation, however you pity the reſt of my errors, to which there is ſuperadded ſo great a preſumption: not that I believe what I have written ſhould produce the deſired effects; but to indulge my paſſion, and in hopes of obtaining a partial reformation; if, at leaſt, his majeſty purſue the reſentment, which he lately expreſſed againſt this nuiſance, ſince this pamphlet was prepared. Sir, I am your creditor for *Schotti*, and ſhall faithfully render it whenever your ſummons calls: my leiſure has not yet permitted me to tranſcribe ſome things out of it,

which concerns me on another ſubject; but if the detaining of it longer be no prejudice to you, it is in a ſafe depoſitum. Sir, I have not bought two of your laſt books, and yet (poſſibly) I could render you ſome account of them. My thirſt and impatience is too great to ſhew the leaſt indifferency, when any thing of your's is to be had: this does not abſolve you from making him a preſent, who (it may be) takes no greater felicity in the world, than to ſee his ſmall library enriched with your illuſtrious works, and they to come to me *ex dono authoris*. Deareſt Sir, pardon this innocent ſtratagem, and the preſumption of,

SIR,

your moſt faithful, and

moſt obedient ſervant,

J. EVELYN.

SIR, I muſt take this opportunity to give you thanks for your great civilities to my couſin *Baily*, and to ſupplicate the continuance of your favour to him, as by which you will infinitely oblige an induſtrious and deſerving gentleman.

Say's-Court, Nov. 23, 1664.

SIR,

THE honour you deſign me by making uſe of that trifle, which you were lately pleaſed to command an account of, is ſo much greater than it pretends to merit, as indeed it is far ſhort of being worthy your acceptance: but if by any ſervice of mine in that other buſineſs, I may hope to contribute to an effect the moſt agreeable to your excellent and pious nature, it ſhall not be my reproach, that I did not my beſt endeavour to oblige it. I do every day, both at *London* and at home, put Sir *Richard* in mind of this ſuppliant's caſe; and, indeed, he needs no monitor, myſelf being witneſs, that he takes all occaſions to ſerve him in it; nor wants there any diſpoſitions, (as far as I can perceive) but one ſingle opportunity only, the meeting of my lord privy ſeal, (who, for two or three council days, has been indiſpoſed, and not appeared) to expedite his requeſt; there being a reſolution (and which Sir *Richard* promiſes ſhall not ſlacken) both to diſcharge the poor man's engagements here, and afford him a competent viaticum.

As for that ſacred work you mention, it is ſaid, there is a moſt authentick copy coming over, the laudable attempt of this perſon being not ſo fully approved. This is, in ſhort, the account I have, why the impreſſion is retarded. I ſhould elſe eſteem it one of the moſt fortunate adventures of my life, that by any induſtry of mine, I might be acceſſary in the leaſt to ſo bleſſed an undertaking.

IF my book of architecture do not fall into your hands at *Oxon*, it will come with my apology, when I ſee you at *London*; as well as another part of the *Myſtery of Jeſuitiſm*, which (with ſome other papers concerning that iniquity) I have tranſlated, and am now printing at *Royſton*'s, but without my name.—So little credit there is in theſe days, in doing any thing for the intereſt of religion!

I KNOW not, whether it becomes me to inform you, that it has pleaſed his majeſty to nominate me a commiſſioner, to take care of the ſick and wounded perſons during this war with our neighbours: but ſo it is, that there being but four of us deſigned for this very troubleſom and ſad employment, all the ports from *Dover* to *Portſmouth*, *Kent* and *Suſſex*, fall to my diſtrict alone, and makes me wiſh a thouſand times I had ſuch a collegue as Mr. *Boyle*, who is wholly made up of charity, and all the qualifications requiſite to ſo pious a care. But I cannot wiſh you ſo much trouble, the proſpect of it would even draw pity from you, as well in my behalf, as for the more miſerable, who foreſee the confuſion and importunities of it, by every article of our buſy inſtructions. But the king has laid his poſitive commands on me; and I am juſt now going towards *Dover*, &c. to provide for miſchief. Farewel ſweet repoſe, books, gardens, and the bleſſed converſation you are pleaſed to allow,

Dear Sir,

your moſt affectionate, and

moſt obedient ſervant,

J. EVELYN.

P. S. Mr. *Goldman*'s dictionary is that good and uſeful book, which I mentioned to you.

HERE is Mr. *Stillingfleet*'s new piece in vindication of my lord of *Canterbury*'s. I have but little dipped into it as yet: it promiſes well, and I very much like the epiſtle; nor is the ſtile ſo perplexed as his uſually was. Dr. *Mer. Caſaubon*, I preſume, is come to your hands, being a touch upon the ſame occaſion.

ONE *Rhea* has publiſhed a very uſeful and ſincere book, concerning the culture of flowers, *&c.* but it does in nothing reach my long ſince attempted deſign of that entire ſubject, with all its ornaments and acceſſories; which I had ſhortly hoped to perfect, had God given me opportunity.

YOUR ſervant, my wife, moſt humbly kiſſeth your hands, as I do Dr. *Barlow*'s, &c.

Say's-Court, April 13, 59.

SIR,

HAVING the laſt year drawn a good quantity of the eſſence of roſes, by the common way of fermentation; and remembering how ſoon it went away, amongſt the ladies, after they had once ſcented it; the ſeaſon of flowers now approaching, makes me call to mind, to have known it ſold by ſome chemiſts (and in particular by one *Longfire* at *Chicheſter*) mixed with a ſubſtance not unlike it; which retained the odor of it wonderful exactly; but in ſuch a proportion, that for ſeven or eight ſhillings a ſifter of mine was uſed to purchaſe more, than any man living

living can extract out of three or four hundred weight of roſes, by the vulgar, or *Glauber*'s preparation: by which means, that precious eſſence may be made to ſerve for many ordinary uſes, without much detriment. Sir, I am bold to requeſt of you, that if you know what it is (for if you know it not, I deſpair of encountering it) you will be pleaſed to inſtruct me; and, in lieu thereof, to command me ſome ſervice, by which I may teſtify my great ambition to obey you, and how profoundly ſenſible I remain, of my many obligations to you, which, I ſhould not have been thus long in expreſſing, had not I apprehended, how importune letters are to ſtudious perſons, where the commerce is ſo jejune; and that I can return you nothing in exchange, for civilities I have already received. Sir, I have reaſon to be confident, that you are upon ſome very glorious deſign, and that you need no ſubſidiaries, and therein you are happy; make us ſo, likewiſe, with a confirmation of it; that ſuch as cannot hope to contribute any thing of value to the adornment of it, may yet be permitted to augure you all the ſucceſs, which your worthy and noble attempts do merit; in the mean time, that ſome domeſtick afflictions of mine have rendered me thus long uſeleſs, both to my friends, and to myſelf; which I wiſh may be thought a juſt apology for,

Noble Sir,

your moſt humble and
moſt obedient ſervant,

J. EVELYN.

SIR, I know the impoſtors multiply their eſſence of roſes with *ol. lig. Rhodii*, others with that of *Ben*; but it can be neither; for the oil of roſe-wood will vanquiſh it exceedingly, neither is it ſo fluid; and the other grows rancid. Some have told me, it was ſperma-ceti, which I have not eſſayed.

YOUR commands will at any time find me, directed to the Hawk and Pheaſant upon *Ludgate-hill*, at one Mr. *Saunders*'s, a woollen-draper.

Letters from Sir Robert Southwell *to Mr.* Boyle.

Kingſale, July 16, 1658.

Moſt Honoured Sir,

I AM ſorry I cannot return a more ſuitable acknowledgment unto your favours, than what a ſorry piece of paper will expreſs; and yet in thanks (the moſt eaſy way of gratitude) I find a ſcarcity, when I judge of your courteſies by a proper and due valuation. I can only hope, that I may live to be grateful, and to have opportunity of manifeſting, that your favours have not been caſt into a forgetful hand. And to that purpoſe I ſhall implore my better fortune to make me ſerviceable unto you, if it ſhould happen, that any of your occaſions ſhould ſtoop ſo low, as that my impertinent endeavours might contribute any thing to their advantage. My moſt humble ſervice to my lord *Dungarvan* and his brother. My mother and ſiſter (who are only now at home) preſent their humble reſpects unto you, and ſo, begging your pardon, I reſt

your moſt obedient ſervant,

ROBERT SOUTHWELL.

Florence, Oct. 10, 1660.

Moſt Honoured Sir,

HAVING now paſſed three months at *Florence*, and the ſeaſon giving me liberty to enter *Rome*, I ſhall, before I leave this place, give you ſome account of the time I have here ſpent, as the perſon, whoſe favour my chiefeſt ambition has always courted. At my firſt arrival here, obſerving ſo rare a frame of government, for order and harmony, more like that of a family, than of a commonwealth; and underſtanding, that all perſons ought to live here as upon the ſtage; ſo exact a knowledge, and ſo common a reſort is the prince's ear, of all particulars that paſs; I thought it requiſite, for the arriving unto ſome kind of admiſſion in the court, wanting the benefit of friends, to ſettle my reputation in a lower claſs. And obtaining entrance into a meeting of their virtuoſi, I alſo put in an oar, and ſhot my bolt among them; and then got not only the occaſion of chooſing good acquaintance, but heard, that at the court ſome favourable words paſſed of me; ſo that thence I took hint to go and make my reverence to the Great Duke, and ſome time after to prince *Leopold* his brother; who certainly is a perfect Mæcenas, not only the patron to all that pretend to letters, but alſo admirably knowing, and illuminated himſelf. The truth is, I was treated by his highneſs, according to the ſtandard of his goodneſs, not my ſorry merit; having admiſſion by his favour to partake of the magnificent ſolemnity at his academy of the *Cruſca*, where both the body and the mind had an incomparable regale. Beſides the invitation I had to come every night to the palace, and view the ſtars, eſpecially Saturn; whereof his highneſs took ſpecial obſervations, according to *Eugenius*, having proſpective glaſſes of nine ells long. But, in fine, his highneſs's darling ſtudy is that of natural experiments, for the proſecution of which he has a ſelect company, that with him every morning make a private academy. He was pleaſed to aſk me of thoſe in *England*, that have the vogue, as to that kind of application. And having named two or three, I finally repreſented unto his highneſs, in thoſe ſlender terms I was able, the imperfect character of Mr. *Boyle*; for whom I can aſſure you his highneſs expreſſed ſo great a paſſion to be acquainted, that, letting him know,

know, he was as much a maſter of civility as knowledge, and that I believed I might be the mediator of a correſpondence, his highneſs told me, that I would engage myſelf in a very grateful embaſſy. So that to tell you the naked truth, the encloſed, that I here ſend you, is written in *Florence* (though dated from abroad) with deſign to be ſent unto you within this of mine; but with pretext directed to me, that ſo the prince may a little keep ſtate, and yet ſecure your correſpendence.

THE perſon, that writes the letter, is the duke's chief mathematician, a perſon of an admirable clear head, very great ſincerity, and much eſteemed by them. I having, by very great favour, obtained to be his ſcholar, for my introduction into the mathematicks, with the ſix firſt books of *Euclid*; he deſired my advice in the preſenting ſome of his books to the Engliſh virtuoſi; being a treatiſe in folio *de maximis & minimis*, and a divination or ſupplement of what is wanting of *Apollonius*. There are half a dozen ſent away to be ſhipped at *Leghorn*, he having ſuperſcribed the firſt unto yourſelf. He was *Galilæus*'s ſcholar three years, and the only one, that is now living. I ſhall mention more of him to Mr. *Oldenburg*. And being moſt confident, that if you ſhall pleaſe to embrace this occaſion of correſpondence with the prince, it will highly redound, not only to your own ſatisfaction, but even a general advancement of learning; and I ſhall number it among the felicities of my life, that I was but inſtrumental unto ſo great a good.

I AM ſure there will paſs the communication of great ſecrets between you, although I do remember the prince told me, that they ſearched not ſo much after particular experiments, as thoſe fundamental ones, that augmented the limits of nature. They are here at preſent very intent on extracting the ſalts from all kind of things, and do, by the help of glaſſes, draw the perfect figures of all; and theſe obſervations at large are made, that the moſt pointed ſalts come from the more ſour or bitter herbs or roots; and from ſweet herbs more blunted ſalts are extracted. Thoſe herbs, *&c.* that afford the moſt ſharp and edged ſalts, are of fierceſt operation in phyſick. The others, that have not ſo much edge to cut and penetrate the humours, are of leſs activity. And the duke's deſign is, to find a way for the adminiſtring theſe ſalts in phyſick, mixing them with things more congenical unto nature, than their own drug, which operates nothing after this ſeparation.

I HOPE in my next to ſend you two or three very good experiments, which I have now in chace. And I am trying, if it be poſſible, to obtain the ſecret of the incombuſtible cloth; which is in the hands of a frier of *Genoa*, that made for the cardinal here many fine things, purſes, hatbands, handkerchiefs, lace, *&c.* I have ſent you a bit of the thread, and a ſhred of the paper he made. But I underſtand, that he was wonderfully ſhy and ſecret when he wrought here.

I HAVE one of the Bologna ſtones (*ſpongia lucis*) ready calcined, which truly I forgot to put into the box, or you had received it together with ſignor *Viviani*'s books. I have alſo fine ſtones uncalcined, which ſhall be at your ſervice, given me, when I was at *Bologna* (and ſeeing of *Aldrovandus*'s Cabinet) by Dr. *Ovidio Montalbano*, the antiquary, with whom I hold correſpondence, and can ſerve you in that place in what you pleaſe.

THE prince has correſpondence with monſieur *Bullialdus*, and others of *Paris*, unto whom he punctually repays all their addreſſes. So that if you pleaſe to write to the prince under cover to ſignor *Viviani*, for the firſt time, taking notice to this of the preſent of his book, and to the prince, of the notice I gave you, of his courteous inclination to your acquaintance, you will find all things afterward run in a prompt and ſmooth channel. For beſides what I mentioned of you myſelf, they found afterwards a piece, that Dr. *Wallis* dedicated to you, the epiſtle whereof was very conſonant with what I had ſaid.

NOBLE Sir, I might have propoſed this affair in more ſtudied terms of my reſpect. But at this age of your acquaintance, and moſt benign condeſcenſion towards me, I cannot but know, how much your goodneſs outbids all my faults. If this winter, at *Rome*, I may receive your commands in any nature, you will infallibly find me,

Noble Sir,

your moſt devoted and

moſt obedient ſervant,

ROBERT SOUTHWELL.

Rome, March 30, 1661.

Worthy Sir,

ALTHOUGH I have not the happineſs to hear from you; yet the freſh reſentment, that I have of your paſt civilities, keeps me ſtill to an obſervance of my duty and gratitude. From *Florence*, the laſt ſummer, I wrote unto you; and at the ſame time the mathematician of the Great Duke, a perſon of excellent qualities, ſent you one of his books; and I was in hopes, that long before this time there would have been a firm correſpondence between you, for it is deſired here; and on the other ſide I know you have no averſion to it, but rather a genius to confer with all perſons, that are ſingular in their kinds.

THERE is certainly ſome unhappineſs arrived in the buſineſs, and I am ſorry for it.

I HAVE now ſpent ſome months at *Rome*, and to my very great ſatisfaction, having viſited and made acquaintance with ſeveral perſons of great excellency in this place; of which hereafter I ſhall be ready to give you an account.

FATHER *Kircher* is my particular friend, and I viſit him and his gallery frequently. Certainly he is a perſon of vaſt parts, and of as great induſtry. He is likewiſe one of the

moſt naked and good men, that I have ſeen, and is very eaſy to communicate whatever he knows; doing it, as it were, by a maxim he has. On the other ſide, he is reputed very credulous, apt to put in print any ſtrange, if plauſible, ſtory, that is brought unto him. He is philoſopher enough, to give ſome kind of reaſon or other for whatſoever you will demand of him. He has often made me ſmile, to ſee how he will fetch about things; as concerning the Soland gooſe in *Scotland*, he argues thus, that the Dutchmen, that went to *Nova Zembla*, ſaw on the ice near the North Pole ſuch quantity of eggs, that were ſufficient to feed all *Europe*; now the ice coming to melt, and theſe eggs to drop into the ſea, and there lye at the mercy of the waves, they turn the ſea into ſuch a caudle, that thoſe iſlands, that are moſt near, as in particular *Scotland*, come to receive ſome of theſe eggified waves daſhing againſt them. Now if it happen, that certain trees are ſo favourably planted near the ſhore, as that the ſparkling and drops of ſuch waves light on and ſoak into them, it may ſo fall out, that, by the ſpecifick virtue of the eggs, ſtill inherent in ſuch water, the natural vegetation of the tree, and the omnipotent influence of the ſun, all theſe combining together, may hatch a Soland gooſe. What you will ſay to this pedigree, I do not know. The truth is, the father has ſtrange ſtories, as to generation. He told me of a wench, that after long complaint, felt ſomething crawling in one of the great muſcles of her back; which being opened, there hopped out a frog. The reaſon he aſſigns, that the ſmock of this maid being where the frogs came to ſport, ſome kind of ſperma fell on it; which after, by the heat of the girl's back (as girls are warm) was attracted in between ſome muſcles, and there nouriſhed, till the ſurgeon plaid the midwife.

As to the flower growing from its aſhes, he had ſuch a thing, but it is now ſpoiled; he made it not himſelf, but it was given him. However he has given me the receipt thereof, upon a ſwop, wrote with his own hand; it is long and intricate, and of a nice preparation. At our meeting you ſhall have it.

ALL the queſtions you bid me aſk him, he affirmed to me in the ſame manner, as you find them written. As to the *ſpelunca ſerpentum*; he is out, to attribute the cure to the licking of the ſerpents; for being, a while ſince, about twenty miles off, hunting with cardinal *Urſino*, his eminence ſhewed me the place, at ſome diſtance, on his own land; ſaying there was a hole, of ſome capacity, which, in the ſummer time, when the air was favourable, did make people ſweat, that went into it, by a kind of mineral vapour, that does ariſe (as at *Naples* there are two or three.) In the ſame place are alſo many ſerpents, which crawling about, and finding a man ſweating, lick the moiſture they find on him (he lying with a hollow glaſs over his face.) But all this does nothing; for if one would ſtand in the hole, with a ſtick, while the other ſweat, and beat away the ſerpents, and wiped the body with a cloth, the ſame ſucceſs would follow. This the cardinal himſelf told me, with whom I ſtaid two or three days. He is a perſon of great curioſity and infinite civility.

I FORGOT to tell you from *Florence*, of a pretty humour, obſerved in two flowers there; the one is yellow in the morning, and about noon turns red. The other has no ſmell at all till at an hour in the night, and then for an hour it begins to ſmell with great flagrancy; and ſo to ceaſe till the night following.

SIR, about the latter end of this ſummer, I hope to kiſs your hands in *London*. Mr. *Sidney*, that lives very handſomly here, and in great eſteem, ſince he quitted his charge in *Denmark*, talks often of you when we meet. I much deſire to hear from you, which I may do, if you ſend your letters to Mr. *Stanye*, merchant in St. *Mary Axe*, *London*.

SIR, I kiſs your hands, and with all affection (and in very good health) I reſt,

your moſt humble ſervant,

ROBERT SOUTHWELL.

Dublin, Aug. 12, 1662.

Noble Sir,

I AM eaſily convinced, that I cannot do myſelf a greater courteſy, than to manifeſt, at what diſtance ſoever I am, the ſignal value and veneration I have towards you; eſpecially conſidering how happy a portion of your civilities, and peculiar kindneſs, have fallen, as the ſucceſs of thoſe paſſions, unto me.

I AM only unhappy, that I am in no hope of having any other title to your friendſhip, than that of a long acquaintance; ſince an unfortunate backwardneſs makes me unuſeful to you in any point of commerce: and if you had not that rare practice of ſelf-denial, whereby you unbend yourſelf to the level of ordinary converſations, I ſhould not reach the leaſt degree of that intereſt I am now ſo fortunate in.

I WISH, that I might have the honour of hearing from you, while I am here, to redeem the longing I had at *London*; and, to know, in fine, what is the product of our ſecret for the fuſion of cryſtal. I know your great curioſity for all trials, beſides the particular paſſion you had for the knowledge of that, has ſhewed you, by this time, the full extent of it: and, for my own part, I have ſo high an expectation from it (conſidering the manner and terms on which it was entruſted to me) that I ſhould have continued puddering myſelf till I had ſeen the end, if I had not met the warrant of ſo great and inviolable a ſecreſy, beſides the ſingular dexterity you have for it. And I was not a little confirmed in the atteſtation and effect thereof, given me by ſignior *Borrhi* (when he perſuaded himſelf obliged to reveal ſomething conſiderable unto me) that at your reading of

the proceſs, you found no matter of exception, which would have certainly been obvious to you, having made ſome adventures and eſſays on that ſubject before.

IF you have made any pieces of the matter, you may pleaſe, by the opportunity of Mrs. *Johnes*, or any other, that comes ſooner this way, to let me have a ſhare of it, and I ſhall be very glad to ſee it.

SIR *John Percival*, his lady, and my father, who is now here, preſent all their humble ſervices unto you; and thus, with my true reſpects unto the noble family, where you ſometimes are, I kiſs your hands, and ever am,

Noble Sir,

your moſt humble,

and obedient ſervant,

ROBERT SOUTHWELL.

Kingſale, March 20, 1675.

Moſt Honoured Sir,

IT has often come into my mind, and indeed I thought, that I had accordingly wrote lately of it, that concern of your's, which, long ſince, you were pleaſed to honour me with the truſt and care of; I mean, that ſtock of money, which, out of your great bounty and charity, you were pleaſed to diſtribute amongſt thoſe miniſters, that had ſerved the cures upon your impropriate eſtate in this kingdom, and of the diſtribution of which I did long ſince return you an account, and alſo what balance remained unto you, after ſatisfying all the concerned, which was forty-five pounds, and has ever ſince lain ready for your order of diſpoſal, and I have ever ſince waited for it: and I did the laſt year, when I was in *London* with my ſon, wait on you at your houſe, there to receive your orders about it, but you were not then at home, nor was my ſtay after that very long in *London*. But, methinks, it is now high time for me to conſider, whether in this long ſilence, the maſter have not forgot his ſteward; or that, which is moſt dangerous, whether the ſteward have not forgot his maſter in this account. But that muſt not be; and therefore, I do here make bold, to put you in mind of it; that forty-five pounds of your ſaid ſtock does yet remain in my hands, and that I do but wait for your order to diſpoſe of it; and ſhall as punctually obſerve it when it comes; and yet ſhall ſtill reckon myſelf in your debt for the honour of that truſt and employ. And with my very hearty prayers unto God for your long life and proſperity, I take leave, and remain,

Moſt Honoured Sir,

your honour's moſt humble,

and faithful ſervant,

ROBERT SOUTHWELL.

Letters from biſhop Barlow *to Mr.* Boyle.

Queen's College, Oxon, Sept. 13, 1659.

SIR,

IT is now a good while ago ſince (in obedience to your command) I ſignified to Dr. *Sanderſon*, that in caſe he would ſeriouſly ſet himſelf to write caſes of conſcience, (1. explaining the nature of conſcience, the obligation of it, how far that extends, and the reaſons of it, with ſome univerſal principles, and general rules, concerning it, *in theſi*; and then, 2. *In hypotheſi*, to fall to the reſolving particular caſes) you would allow him fifty pounds per annum, to encourage him in that good work. With what thankfulneſs the good old man accepts of this your great charity (rare in any age, and unheard of in this) you may (in part) ſee by this encloſed; and, I doubt not, but the preſent age and poſterity may have juſt cauſe to bleſs God in this particular, and thank you for being the only occaſion, and ſole encourager of ſo good a work. May the gracious good God of heaven and earth bleſs you, and all thoſe pious and generous ſouls, who dare be good in bad times. This is, and ſhall be, the prayer of,

SIR,

your moſt obliged,

humble ſervant,

THOMAS BARLOW.

WE have no news, ſave what this bearer (your great ſervant) can better tell, than I write. Dr. *Wilkins* is gone *(cum pannis)* to *Cambridge*, and left his great teleſcope to the library: our buſineſs now is to place Mr. *Selden*'s books, which will go near to fill up the other end of our library: they are conſiderable for the number (about eight thouſand volumes) but more for the quality, eſpecially his oriental manuſcripts, being many, and choice.

Queen's-College, Oxon, Jan. 30, 1659.

SIR,

TWO days ago, I received a letter from Dr. *Sanderſon*, with an acquittance (here encloſed) for the receipt of thoſe monies your charity was pleaſed to give him, as an honorary ſtipend and encouragement, for writing caſes of conſcience. If this form (by him ſubſcribed and ſent) be not ſuch as you would have, he will cheerfully ſubſcribe any other, which your prudence ſhall think more convenient. He further deſires (as you will ſee by the encloſed piece of his letter) to know your commands, in order to his progreſs in the work, which, by your encouragement, he has undertaken; that ſo he may (as in reaſon he ſhould) conform himſelf and ſtudies to your deſires. If you have no better way to communicate your commands to him, if you

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ſhall be pleaſed to convey them to me, I ſhall to him. My reſpects and humble ſervice to yourſelf, my love to Mr. *Pett* (who I know will wait upon you). God Almighty bleſs you, and all thoſe generous ſouls, who dare be charitable and good in bad times, who have munificence, and courage enough, to embrace virtue, though coſtly and dangerous. This is the hearty prayer of,

SIR,
your moſt obliged,
humble ſervant,

T. BARLOW.

Incloſed in the preceding.

I WOULD willingly know Mr. *Boyle*'s mind, whether he would rather I ſhould proceed to finiſh this work, according to the deſign exhibited in the ſcheme prefixed before the lectures, or make choice of ſome other argument; and whether in Latin, or Engliſh: for I ſhall endeavour to apply myſelf to his direction for that matter, in any thing within my ſphere. I deſire my thanks and ſervices may be preſented to him; wiſh your proſperity, and reſt,

your affectionate friend,
and humble ſervant,

Botheby-Paynell,
Sept. 20.—59.

ROBERT SANDERSON.

Mr. Boyle *to biſhop* Barlow.

My Lord,

THE commands your lordſhip was pleaſed to give me, to acquaint you with what I might hear about the conteſt between the French king and the pope, gives me a welcome excuſe for the liberty I take of putting you in mind of one of your old and true ſervants, who lately, upon enquiry ſolicitouſly made about the French affair, received an account of it, that the diſpute about the Regale ſeems rather to grow ſharper than calmer. For the laſt letters from *Paris* inform us, that there is a breve come thither from the pope to the provincial of the jeſuits, to expel father *Maimbourg* out of their order, and that the provincial carried it to the king's attorney, who acquainted the parliament with it. Whereupon there enſued either an arreſt (as they call a decree) or a reſolution ſpeedily to make one (for I do not preciſely remember which it was, though I think it was the former) importing, that if any order whatſoever of monks or friers ſhould receive and admit any breve from the pope, without leave from the king, they ſhould forfeit all temporalities that order poſſeſſes in *France*. It is ſaid, and very eaſily to be believed, that this doth not a little alarm and puzzle the cloiſters, particularly thoſe of the Jeſuits, who will now perhaps be put to give ſome inſtance of thoſe refined politicks, that the world has long thought them maſters of. For my part, I know not what to think, if this pope be not, what I ſuppoſe your lordſhip believes moſt of his predeceſſors have been, more a bigot than a politician; but I am pretty confident, againſt the jealouſies of many here, that whether or no this conteſt will prove the cauſe of a rupture, it is not at leaſt the effect of a colluſion, which both the pope and the French king are too haughty to allow me to think it; and which, if it were real, would not perchance compenſate the inconveniences, that what has been done already is like to bring upon the Roman ſee. But I wiſh this were all the news about matters of religion I could ſend your lordſhip out of *France*. For the day before yeſterday I was viſited by a rich knight of that country, that come purpoſely to let me know, that the French king was putting out a decree, (whereof within leſs than a week he might expect a copy) ordaining, that all the children of proteſtants, at the age of ſeven years, after having been for ſome days taken from their parents, who, it is pretended, might hinder the freedom of their choice, be put to declare what religion they would be of: and thoſe, that ſhall embrace the Roman, ſhall be bred up in it in ſpite of their parents, who ſhall not have power to deny them maintenance. And this decree is to be followed by another, ordaining, that if the child of any proteſtant parent be not baptiſed within three days after its birth, (which in many places cannot be done, the churches being demoliſhed, and the miniſters driven away) the Roman catholick prieſt ſhall baptiſe the child, and ever after breed him in their religion. I willingly acquaint your lordſhip with theſe particulars, becauſe the knowledge I have of your zeal for proteſtaniſm in general, and your moderation towards thoſe, that profeſs it, though in ſomewhat differing forms, makes me hope your lordſhip, and other prelates of our church, will take this fair opportunity to recommend its moderation to other churches, by protecting and countenancing thoſe poor people, whom this rigorous perſecution has induced to take ſanctuary here, where already there were lately ſeen in the ſingle port of *Dover* above one hundred and fifty boys and girls newly brought over, for fear of the daily expected edict. And if to the conſideration of religion I thought it neceſſary, when I write to your lordſhip, to add any others, I might tell you, that though many of theſe perſecuted people are far more rich in faith than in the goods of this world; yet there are many others, that bring over, as ſome of them have already, conſiderable ſtocks with them, ſo that if they be encouraged, it is thought, that above a hundred thouſand pounds, or perhaps double that ſum, will in no long time be brought or returned into *England*, in caſe the owners ſettle here. But to return to what I was ſaying about the French conqueſts, a thought has ſeveral times run in my mind, that, with my wonted freedom, I ſhall not ſcruple to acquaint my confeſſor with, which is, that perhaps providence will bring this affair to

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ſome ſuch reformation, as was made here in *Henry* VIII.'s time; ſince this French king does, as that Engliſh monarch did, at the ſame time both perſecute the proteſtants, and affront the pope. If I hear any thing of the progreſs of this buſineſs worth your lordſhip's knowledge, the commands you were pleaſed to impoſe on me in reference to it, will continue to have their accuſtomed influence on,

My lord,

your lordſhip's moſt humble

and moſt affectionate ſervant.

I BEG to know, how your lordſhip enjoys your health in this ſickly time, and that you will be pleaſed to remember the paper I preſumed to put into your hands, when I kiſſed them at Mr. *Notts*'s.

Superſcribed thus,

To the right reverend father in God, Thomas *lord biſhop of* Lincoln. *Preſent at* Buckden: *dated* July 7, 1681.

Buckden, July 12, 1681.

Moſt honoured friend,

I RECEIVED your letter, and this comes (with reſpects and ſervice, which are moſt due) to bring my thanks for the honour you have done, and the great kindneſs in communicating (which, beſides yourſelf, very few could) ſuch ſignificant and material intelligence. For your foreign news, though I could wiſh (rather than hope) that all Chriſtians were (as they ought) at peace one with another; yet I am well content, that the French king and the old gentleman at *Rome* do quarrel. I do not doubt, but that *Rome* is myſtical *Babylon*, and the pope that beaſt, that antichriſt who rules there: and as the infinitely wiſe and juſt providence of heaven ordered things ſo, that the kings of the earth gave their power to the beaſt to make him great; ſo the ſame good providence will (in his good time) put it into the heart of thoſe kings to ruin *Rome* and the beaſt too. If I could ſee the French king (who, I believe, cares not much for *Rome*, or its religion) fall off from his obedience to the pope, and ſet up a patriarch, (as has been in *Richelieu*'s time threatned) in *France*, independent on the pope, I ſhould not doubt the ruins of antichriſt and *Rome* would ſoon follow. *Faxit, qui ſolus poteſt, Deus.* For the poor perſecuted proteſtants in *France*, they have my compaſſionate pity and prayers; that God Almighty would be graciouſly pleaſed to ſanctify their afflictions, (which really are to all his ſervants *Actus patris, et miſericordiæ*, not *actus judicii et vindictæ*) and in his good time free them from thoſe calamities, and give them reſt and peace; and in the mean time ſupport them with his grace, ſo that they may bear thoſe perſecutions to his glory, the advantage of the goſpel, and the benefit of their ſouls here, and the ſalvation of them hereafter. This we may be ſure of, that when our moſt gracious God brings his people into the fire of perſecution, (as many times he does) it is not out of anger to conſume, but of a paternal care to refine and try them. God's own people, the Jews, were (by the Chaldeans) carried captive to *Babylon*, and (as to outward things) in a miſerable condition. And yet (though neither the Chaldeans nor the Jews ſought for) it was God himſelf, who ſent his people into that captivity, and for their good. However, an indiſpenſable obligation lies upon us here, to be kind and comfortable to thoſe poor perſecuted proteſtants, who fly hither for protection, I hope I ſhall, to the utmoſt of my ability. It is their turn now to ſuffer for the truth; and how ſoon it may be ours, God only knows. Sure I am, that the crying ſins of this nation are ſo many, and ſo great, that they do not only need a refining, but deſerve a conſuming fire. *Dirum omen miſericors (qui ſolus poteſt) averruncet Deus.* For the caſe you left with me, and your commands about it, you may be ſure they ſhall be obeyed, and that ſhortly too. Since my coming hither, partly by my infirmities, and phyſick which I was forced to take for them, and partly through a hurry of unavoidable buſineſs, I have not been able to execute your commands about that caſe: but now (bleſſed be God) being in a better condition of health, and ſomething more free from buſineſs, I ſhall (God willing) give you ſome account of that caſe. My reſpects and ſervice once more remembred, your prayers are deſired for and by

Your obliged friend,

and thankful ſervant,

THO. LINCOLN.

Rev. xvii. 5.

Rev. xvii. 7.

Zachary xiii. 9.

Jer. xxiv. 5, 6.

Buckden, Aug. 26, 1682.

My honoured friend,

I HAVE received yours, and this comes (with my reſpects and ſervice) to bring my thanks for all civilities. It ſeems, that the old gentleman at *Rome*, and the moſt Chriſtian (but ſemi-catholick) king, are not cordially reconciled, and I am not troubled at it. Though I love peace, yet I wiſh war with *Rome* (ſuch as the Jews were to have with *Amalec*) till it be ruined. I commiſerate the ſad condition of the poor French proteſtants; ſome of them in priſons, and ſeverely perſecuted at home; others exiles in other kingdoms: yet theſe calamities (though great) ſhould be to them cauſe of joy, if they live according to that good religion they profeſs; for to men truly pious, impriſonments, exile and captivity are for their good, (though to wicked men, and impenitent ſinners, they are not ſo.) To God's children,

Deut. xxv. 19.

Acts v. 41. Jer. xiv. 5. Heb. xii. 10.

Jer. xiv. 9, 10.

the

the greateſt afflictions and perſecutions, are *Actus patris, non judicis*; *actus miſericordiæ, non vindictæ*; they are *chariſmata, non ſupplicia*, bleſſings, and not puniſhments; *non pœnæ, ſed medicinæ*. But I hope you will pardon this extravagance. All our diſcourſe here is about the comet, which now appears in the north. I am no aſtrologer, yet if you will pardon my confidence, I will tell you what I think of comets. 1. In the general, it has been the received opinion of pagans and Chriſtians, that they portend ſome calamity to come upon ſome nation, country, or city, *&c.* Οὐδεὶς κομήτης ὅσις ϗ κακὸν φέρει, ſay the Greeks; and the Latins, *Nunquam futilibus excanduit ignibus æther*. 2. There are ſome things concerning comets, which may be calculated by art, and certainly known. As 1. Their motion. 2. Their magnitude. 3. Their altitude, by the parallax. 3. But there are other three things, which (to me) ſeem not only δυσνόητα, difficult, but ἀνεξιχνίαϛα, impoſſible to be known by any. As 1. Their generation, how they come to appear, and of what matter they are made. 2. Their ſignification, what they (in particular) portend, and to what particular nation, country, city, or perſon they relate, for I ſuppoſe, that it is not all the world they threaten, becauſe there may be, and are ſome parts in the world, to which ſome comets do not at all appear, and therefore cannot threaten them. 3. Their vaniſhings, how, and by what means they diſappear, and what becomes of them, when they ceaſe to appear to us. Theſe three things ſeem to me impoſſible to be known by any art, or artiſt. But this is another extravagance, for which I beg your pardon; it was not concerning comets, but a caſe of conſcience, of which you required my opinion; and how that caſuiſtical rule (*in dubiis pars tutior eſt eligenda*) is to be underſtood. I have not forgot your commands; I have oft thought of it, ſince I received your commands in *London*; and having never *ex profeſſo*, ſeriouſly ſtudied that point, I find many perplexed and difficult caſes, which will not eaſily be explicated, ſo as to give clear and full ſatisfaction. There was ſomething (if I forget not) about this point, in the papers *De Voto*, I formerly ſent you; if you would be pleaſed to lend me them, (for I have no copy of them) I ſhould be better able to ſtate the whole caſe, and bring it, and your papers with it, at my return to *London*, which will be about *Michaelmas*. I once more beg your pardon for this tedious and impertinent ſcribble, and ſhall only add, that I am,

Phil. it 29. To you is given, κεχάρισται.

Your moſt obliged, thankful,
and faithful ſervant,
THO. LINCOLN.

Buckden, Oct. 10. 1683.

My Honoured Friend,

MY laſt night's letters tell me of an earthquake, with a prodigious noiſe accompanying it, in the country; and this comes to tell you (my humble ſervice remembered) that here, in this county, and (as I am informed) in ſome other counties adjoining, we had an earthquake too, on Saturday laſt, about eleven and twelve o'clock at night, but without any noiſe of winds or thunder. I was in bed reading (as uſually) a chapter in the bible, and I perceived my bed to move a little, and a little cracking of ſomething above; but I little dreamed of any earthquake, but read on, and then ſlept quietly till the morning; when ſome of my ſervants told me, there was an earthquake, and that they perceived their chambers to ſhake, ſo ſenſibly, that one of them roſe out of bed; I ſcarce believed them, till ſeveral of the town and county told me, that their houſes were ſo ſhaken, the ſame night, and ſome more, ſome leſs; but no harm any where done, unleſs ſome pewter ſomewhere caſt down, or ſome panes of glaſs broken. Theſe are *portenta*, and *prodigia*, and what they ſignify, I neither know, nor ſhall enquire. But ſure I am, unleſs we repent of our crying ſins and iniquities, our highly offended God and moſt gracious father, may juſtly ſhake us, with ſeverer judgments. Your prayers are deſired by and for

your moſt obliged
thankful ſervant,
THOMAS LINCOLN.

I HEAR nothing ſince your laſt, of the old gentleman at *Rome*.

Buckden, April 2, 1683.

My Honourable and Worthy Friend,

I HAVE received yours, which was very welcome to me, becauſe yours. I am glad your illneſs and indiſpoſition is only ſuch, as does not confine you to your chamber, though to your houſe it do. It is (and ſhall be) my prayer, that God Almighty would be graciouſly pleaſed, to grant you health, to his glory, the publick good, and the comfort of your friends and relations. That the differences between the French king and the pope are (as it ſeems they ſay) almoſt terminated, I am of your opinion, they may poſſibly be kept from an open rupture, but that they ſhould be really made friends, I neither do, nor can believe. The pope has ſo exceedingly provoked the French king (who is, they ſay, more apt to revenge, than remit injuries) by his excommunications, interdicts, denying the privileges of his embaſſadors, *&c.* that they will not eaſily be forgiven or forgotten. So that the old verſes, a little altered, may ſuit well with the French king:

——— manet altâ mente repoſtum
Judicium papæ, ſpretique injuria Galli.

FOR the little pamphlet you are pleaſed to mention, and kindly approve, I muſt confeſs (how

(how weak ſoever it may be) I am the author of it, though for ſome reaſons (which ſeemed juſt to me) I did conceal my name. But now it is known to be mine, and as I do really believe the things ſaid in it to be evident truths, ſo it is my hope, that (by the aſſiſtance of our moſt gracious God) I ſhall never be aſhamed, nor afraid publickly to profeſs it; notwithſtanding any threatning circumſtances, in which the good providence of heaven may place us. Thoſe ſayings of our bleſſed Saviour ſhould not be forgotten. When that poor pamphlet came to be licenſed, the firſt and laſt argument (about the idolatry of the church of *Rome*) could not be licenſed, and ſo was left out, which I did not a little wonder at. I do herewith ſend you a copy of it, and deſire your cenſure. For I have this opinion of your great underſtanding, that if there be any error, you will ſoon find it, and of your kindneſs to me, that you will tell me of it, that I may ſpeedily correct and retract it. Your pardon for this tedious ſcribble, and your prayers are deſired by and for

Mat. x. 32, 33. Mar. viii. 38.

your moſt obliged, thankful,

and faithful ſervant,

THO. LINCOLN.

Buckden, April 7, 1684.

My Honoured Friend,

THE papers I herewith ſend you, were (at firſt) intended only for a letter, but are grown into a tedious and (I fear) an impertinent diſcourſe. What they concern, when you have opened them, you will ſoon ſee. If you will take the trouble to read them, I deſire your cenſure of my miſtakes, if you find any, as (I fear) you may. Two things I have affirmed in thoſe papers, which may ſeem to you (as they do to many) paradoxes, if not manifeſt errors. That is, firſt, when I ſay, "that the ſin againſt the holy-"ghoſt, cannot now be committed." Secondly, when I intimate, "that the departed "ſouls of the ſaints are not in heaven, nor "do enjoy the *viſio Dei beatifica*, till the day "of judgment." If this be true, as for many (to me) evident occaſions, I believe it is; then it will manifeſtly follow, that your popiſh canonization and invocation of ſaints, their purgatory, indulgences, their jubilees, and ſuch other gainful tricks to get money, will and muſt vaniſh, as impious frauds, to cozen the poor people, and enrich themſelves. So that if it ſhould be known, as (God willing) in good time it may, that I hold this opinion, then I may be ſure, that the old gentleman at *Rome*, and his party, will (with bell, book and candle) anathematize and damn me for a deſperate heretick. But (I thank God) their *bruta fulmina* do not fright me; nor ſhall I think my ſelf leſs catholick, becauſe they call me (what they really are) an heretick. I ſhall deſire this favour, that when you have read theſe papers (if you will caſt away ſo much time to do it) I may have them again (for I have no other copy) that I may have time to conſider and correct them. For upon a review of them, I find (and ſo will you too) that more might have been ſaid on this ſubject, in leſs room, and with more evidence and perſpicuity than I have done; having writ them (as I got time from other buſineſs) by fits only, and not with a fixed and continued conſideration. However (my humble ſervice and thanks for a thouſand civilities remembered) he dare truſt you with all his infirmities, who is

your moſt obliged

friend and ſervant,

THO. LINCOLN.

THAT the carriage may not coſt you more than the papers are worth, the carriage is paid.

Buckden, May 5, 1684.

My honoured friend,

I RECEIVED yours, and (with my humble ſervice) return my thanks. For that paradox, which I mentioned in my papers (which you were pleaſed ſo kindly to accept) "That the ſouls of good or bad men departed "this life, are not in heaven or hell" (as the words are commonly underſtood) before the day of judgment, but in Ἅδης (as the Greeks call it) or a middle ſtate; I was (about three years ſince) aſked my opinion, by a friend, in behalf of a learned gentleman, prebend of *Norwich*; and what I writ to him, I do here ſend you, whom (as I have formerly told you) I dare truſt with all my (very many) infirmities. I do not (as you will ſee by the papers I do now ſend) categorically and peremptorily determine the queſtion, whether there be ſuch a *ſtatus animarum medius, vel non*; nor do I cenſure any of either opinion: yet (at preſent) this I do believe and ſay: that although proteſtants and papiſts generally agree, that the ſouls of all pious men and true penitents, are immediately received into heaven, and enjoy (as the ſchoolmen call it) *viſionem beatificam Dei*; yet I do (with humble ſubmiſſion to better judgments) believe, that the other opinion (that ſuch ſouls are in Ἅδης, or a middle ſtate, till the day of judgment) is more agreeable to ſcripture and the declared and conſtant opinion of the moſt pious and primitive fathers. Some of my reaſons for this, you will find in the papers I now trouble you with: other reaſons there are, which (when there is any neceſſity or opportunity) may be produced. For the other paradox, about the ſin againſt the Holy Ghoſt, you ſhall (when I have a little more time and leiſure) have the reaſons of your moſt obliged and faithful ſervant, THO. LINCOLN.

THESE

THESE papers (if you think them worth the while) you may tranſcribe, but I deſire, that none elſe may have any copy of them. I deſire alſo, that my name may be concealed; and I ſhould take it as a favour, if any would give their objections againſt this *ſtatus medius*, either from ſcripture or antiquity.

Buckden, May 25, 1684.

My honoured friend,

I HAVE received yours, and this comes (with my humble ſervice) to bring my hearty thanks. For *Peter Walſh*'s book, I had notice of the preface of it (in which I am only concerned) before Chriſtmas, while it was in the preſs; and an eminent perſon, who had ſeen ſome ſheets of the preface, ſignified to me, what he ſaid againſt me; "that "I imputed thoſe rebellious doctines to their "church, which the court of *Rome* did, but "the church of *Rome* did not maintain." I had a purpoſe preſently to have anſwered it. But when I got the book (which was ſent me three months ſince by the ſaid eminent perſon) and had carefully read it; I did, and do judge it unworthy of any particular anſwer. For 1. He pretends not to anſwer any of my reaſons, upon which I impute thoſe doctrines to their church. Their general councils (ſuch as the great Lateran council, thoſe of *Lyons*, *Conſtance*, *Trent*, *&c.*) do (*ex profeſſo*) approve and maintain thoſe rebellious doctrines. Now it is moſt certain, that (if any thing be) the definitions of their general councils is the doctrine of their church. 2. As he pretends not, nor endeavours to anſwer any of my arguments, ſo he no way proves what he objects againſt me; only he affirms ſomething, but proves nothing, unleſs a poſitive and confident aſſertion may paſs for a proof. If you meet with any, who think otherwiſe, if I may know what it is, which he thinks cogent and concluſive againſt any thing I have ſaid, I ſhall be willing, and (I hope) able to give him ſatisfaction. In ſhort, father *Walſh* is an ingenious perſon, but far from being a rational writer, as wanting a comprehenſive knowledge of ſcripture and antiquity. For ſcripture, he makes no uſe of it at all, nor do I remember, any one text of ſcripture made uſe of by him to prove any of his poſitions. Sure I am, that while he grants (what is moſt true) that the pope and court of *Rome* maintain, "that the pope has ſuch a ſupreme "extravagant power to depoſe kings and ab-"ſolve their ſubjects from all oaths of alle-"giance," he does (*ipſo facto*) grant, that the pope has that indelible character of anti-chriſt (2 Theſſ. ii. 4.) which is, "to exalt "himſelf above all that is called God;" or above all kings and emperors. The truth is, father *Walſh* has ſaid many things againſt *Rome*, which they value not, nor can they be of any real advantage to us; he being an angry excommunicated perſon, and therefore his teſtimony of little validity againſt them, or for us. As for thoſe impertinent papers I laſt ſent you, concerning the *ſtatus medius* of ſouls departed this life; when you have done with them (if you will loſe ſo much time, as to read them) I deſire you would be pleaſed to return them to

your moſt obliged, thankful,

and faithful ſervant,

THO. LINCOLN.

Buckden, Jan. 10, 1684.

My Honoured Friend,

I HAVE received your's, and (with my humble ſervice) return my hearty thanks, 1. For the information you ſo kindly gave me of *P. Walſh*'s book; for though I had the Book, and had read it long before, yet your kindneſs was no leſs. 2. I return my thanks for your friendly advice, to anſwer father *Walſh*'s objections in Latin, becauſe my book (as you conceive) being only in Engliſh, his objections will come to many, to whom the Engliſh is not underſtood. But the truth is, my pamphlet, againſt which he brings thoſe objections, is extant in French, in Latin, (prince *Rupert* being at the charge of the tranſlation) and (as I am aſſured) in Italian. Yet (upon the reaſon you give) I am reſolved (God willing) as ſoon as I can have a little leiſure, to take his objections into conſideration; becauſe they will give me juſt occaſion to ſay ſeveral things againſt him, and his pſeudo-catholick church, which they would not willingly hear, nor (I believe) eaſily anſwer. 3. For the paradox, concerning the middle ſtate of ſouls, you judge rightly, that I am inclined to believe it: indeed I do believe it, and, after long conſideration, for theſe nine or ten years, have believed it. This I have ſeldom ſaid to any, which I freely ſay to you; whom I dare make my confeſſor, and truſt with all my infirmities. This middle ſtate, is to all God's ſaints and ſervants, a happy eſtate, of great joy and comfort; (though far leſs than that complete glory and happineſs, which they ſhall have after the reſurrection) it is called paradiſe: "This day ſhalt thou be with me in para-Luke "diſe," (ſays our bleſſed Saviour to the pe-xxiii. 43. nitent thief.) That paradiſe was that Ἅδης, or middle ſtate we ſpeak of: for, *in triduo mortis*, our bleſſed Saviour's ſoul was in it: "Thou ſhalt not leave my ſoul (εἰς Ἅδην) in Acts ii. "hell, nor ſuffer thy holy One to ſee corrup-27. "tion." His ſoul was not left in hades, nor his body in the grave to ſee corruption; but his body was within that three days raiſed out of the grave, and his ſoul brought out of ha-Acts ii. des, and united to it, at his reſurrection. 31. Whereas *David*'s body continued in the grave, Acts ii. and ſaw corruption; and (though he was dead 29. above 1000 years before) his ſoul remained in xi. 34. hades, and was not aſcended into heaven. This hades (I ſay) is in ſcripture called paradiſe,

diſe, a place of poſitive joy, and great comfort, to the ſaints of God; and of great torment to impenitent ſinners. *Lazarus* and the rich man (in the parable) were both ἐν Ἅιδῃ, *in communi animarum receptaculo* (as the ancients called it) though in different places, and parts of it. There was χάσμα μέγα, a great gulf between them; and, as the places, ſo the condition of the ſouls in them, was very different. The ſouls of good men were comforted, of bad men tormented: ſo that the ſaints in that middle ſtate are in a happy condition in paradiſe, a place of joy and comfort, freed from all ſin, from all the temptations of Satan, the allurements of the world, from that body of death, or corruptions of the old man, which remain even in the beſt ſervants of God, while alive in this world, of which St. *Paul* complains. And beſides all this, they are abſolutely freed from all deſpair and doubtings, and reſt (for that ſtate is a ſtate of reſt) ſecure, and with a certain and undoubted hope of glory at the reſurrection. It is true, St. *Paul* ſays, "he had a deſire to "be diſſolved, and be with Chriſt, which "was far better," than his being here in this world. 1. To be with Chriſt after his diſſolution immediately; and, no doubt, though our bleſſed Saviour tell his diſciples, that he will be with them here, "to the end of the "world;" (with them, by his grace comforting, and his power protecting them) yet after their diſſolution, he is far nearer to them, both by his grace purifying them from all remains of ſin, compleating all his graces in them, and giving them perfect hope and charity, ſo that they ſin no more, and by his power protecting them, ſo that nothing can diſquiet their reſt, diſturb their peace, or any way hurt them. And hence it is, that he ſays, that it is far better to be diſſolved, than be here in the fleſh; his condition, he ſays, would be far better after his diſſolution, than it was here; (which is moſt certain, and, for the reaſon aforeſaid, granted) but he does not ſay, that it will be a ſtate of beatitude, and enjoying of the beatifical viſion, and that crown of glory. For he himſelf expreſly tells us, that neither he, nor any ſaint ſhall have that crown, "till the day of "judgment." And our bleſſed Saviour tells us, that recompence and reward, which God will graciouſly give his ſaints and ſervants for their piety and charity, is to be given them, not immediately after their death, but "at "the reſurrection of the juſt." I know it has (for ſome ages laſt paſt) been the general opinion, (eſpecially of popiſh writers) that there is no ſuch middle ſtate of ſaints, but that they go *uno ſaltu in cœlum*; and this they muſt ſay, elſe their invocation and canonization of ſaints (by which they cozen the people of their money, and enrich themſelves) would be ridiculous as well as erroneous. But I do alſo well know, that the Jewiſh church, and the primitive Chriſtians, did believe, and their beſt writers did profeſs and vindicate this middle ſtate we ſpeak of; and I do not know any text of ſcripture againſt it: nay, it ſeems evident to me, (with ſubmiſſion to better judgments) that ſcripture clearly confirms the doctrine of the middle ſtate of ſouls. However, though this be my opinion (at preſent) yet I dare not any way cenſure, much leſs condemn any, who are of another judgment. Pray pardon this rude, tedious, and (I fear) impertinent ſcribble, and pray for,

Luke xvi. 22, 23.
Luke xvi. 26.
Luke xvi. 25.
Rom. vii. 24.
Rom. vi. 11.
Phil. i. 23.
Matt. xxviii. 20.
2 Tim. iv. 8.
Luke xiv. 14.

your moſt obliged friend,

and faithful ſervant,

THOMAS LINCOLN.

THE papers you mention to be ſent by the carrier, are not come; and he ſays he had no ſuch papers.

Buckden, Jan. 12, 1684.

My Honoured Friend,

YOUR great and undeſerved kindneſs has given me confidence to trouble you. I am lately informed, by a perſon of great honour, who has good intelligence, that ſome are about a tranſlation of the popiſh canon law into French; which I wonder at. Sure I am, the pope and his party (if they can hinder it) will never permit ſuch a tranſlation to be publiſhed; and, if they cannot hinder it, their power is not ſo great as it has been. I hope it is true, that they are about ſuch a tranſlation; and I ſhould be glad to hear it were finiſhed, and made publick: for there are ſo very many prodigiouſly erroneous and impious canons and decrees in that law, that were it in French, or any vulgar tongue, the honeſt and unlearned laity (who had any love for truth or piety) would abhor that law, and the authors and owners of it. Give me leave to ſet down an inſtance or two, which (I believe) are not unknown to you; and the places I ſhall mention are in their beſt and moſt correct editions of their [a] canon law, and (as ſuch) publiſhed by the pope's authority. And here,

[a] I mean the editions at *Paris*, 1612. with the gloſs; and at *Paris* again, *anno* 1618. and at *Lyons*, 1661.

1. *Gratian* tells us, (what pope *Agatho* told him) that all the popes conſtitutions *irrefragibiliter ſunt obſervandæ*, as if *Peter* himſelf had confirmed and publiſhed them. *Sic omnes apoſtolicæ ſedis ſanctiones accipiendæ ſunt, tanquam ipſius divini Petri voce firmatæ ſint.* They are the [b] words of the canon. And that we may know, what he does mean by theſe words, and how highly we are to prize them, he adds, [c] *Decretales papæ epiſtolæ inter canonicas ſcripturas connumerantur.* So that, by this law, we are like to have a large bible; not only the Old and New Teſtament, but all the new decretals of the old gentleman at *Rome*, and they not apocryphal, but moſt properly canonical.

[b] *Can. ſic omnes. 2 diſtinct. 19.*
[c] *Ibid. diſt. 29. Can. 6. in lemmate & canone.*

2. *Gratian* tells us in that law, that the pope may depoſe kings, abſolve their ſubjects from all oaths of allegiance, and then prefer another to their vacant throne; and gives inſtance in the French king (though the inſtance as to matter of fact be moſt falſe) thus.

Can Alius 3. Cauſ. 15. Quæſt. 6. *Alius Rom. pontifex, Zacharias ſcilicet, regem Francorum, non tam pro ſuis iniquitatibus, quam pro eo, quod tantæ poteſtati eſſet inutilis, à regno depoſuit, & Pipinum in ejus locum ſubſtituit; omneſque Francigenas à juramento fidelitatis abſolvit, &c.* Though the matter of fact be evidently falſe (for ſo the learned French writers have plainly proved it) yet it ſtands ſtill in the body of their law, in all the editions of it.

Johannis Launoius, epiſt. tom. 7. p. 117. 118. & p. 245, 246.

3. GRATIAN tells us (out of pope *Clement* the Vth's epiſtle) "That in the primitive "church, they had all things common" and that the philoſopher ſaid, *Amicorum omnia ſunt communia*; and that "iniquity brought in di-"viſion and propriety." Having ſaid this, he adds: *In omnibus autem ſine dubio ſunt & conjuges.* This (though moſt impious, as well as erroneous) may be pleaſing to their clergy, who, having no wives of their own, may make uſe of their neighbours.

Ca. Dilectiſſimis. 2. Cauſa. 12. Quæſt. 1.

4. THE ſame Italian, in the ſame canon-law, and all editions of it, tells us, that *Meretrix eſt, quæ multorum libidini patet.* It muſt be many, who muſt make a whore; and if you aſk how many will do it? courteous *John Semea*, the learned gloſſator, will tell you, that in the cannon, ſhe is ſaid, *multorum libidini patere, quæ admiſerit plures, quam 23. millia hominum.* And this he proves out of St. *Gregory*, who ſpeaking of 23000 men, calls them *pauci*; and therefore, if *meretrix* be ſhe only, *quæ multorum libidini patet*, then (by this law and logick) none can be a whore, who has not laid with more than 23000. And if this were true, I dare ſay, *Rome*, "the mo-"ther of harlots," has not one whore in it. My dear friend, pardon this impertinent extravagance, and pray for

Can. Vidua 16. Diſt. 34.

Gloſſa ad dictum Can. Ubo. Quæ multorum Can. diſciplina. 9. diſt. 45.

Rev. xvii. 5.

your faithful friend and ſervant,

THO. LINCOLN.

Buckden, 18, 1684.

My honoured friend,

IT is now a good while ſince I troubled you (as in other caſes I have often done) with a ſtory of images unlawfully) (as I did, and do think) ſet up in a church in my dioceſe. The painter and ſome few of the pariſhioners (upon pretence of beautifying the church) waſhed out all the ſentences of ſcripture formerly writ upon the walls; then they ſet up in their places the images of thirteen apoſtles (St. *Paul* for one) and twelve patriarchs, and *Moſes* and *Aaron*. The picture of St. *Peter* they placed above the ten commandments, and that of *Paul* above the king's arms, and they picture *Moſes* (after the ridiculous popiſh way) with horns. They then (*ex poſt facto*) procured an order from the deputy chancellor of *Lincoln*, (the chancellor being abſent) to approve and confirm what they had done. I cauſed the chancellor to null that order: then they appealed to the Arches, where the appeal now depends, and (this next term) the cauſe will come to be heard and determined, whether thoſe images ſhall ſtand or fall. I am no party in the cauſe, neither appellant nor appellee, nor ſo much as named in their appeal, which is only from the chancellor. However, I abhor their ſetting up ſuch images in the church; and to ſhew my diſlike, and the reaſons of it, I have writ a breviate of the caſe, and ſent it to my lord of *Canterbury*, who (being judge of the court of the Arches, though executed by a deputy) may, and (I doubt not) will take care, *ne quid detrementi capiat eccleſia.* A copy of that breviate I ſend here encloſed to you, as to a perſon, who very well underſtands and loves our reformed religion. If (upon peruſal) you approve of my deſign againſt popiſh images, and my reaſons for it, it will be a great encouragement and comfort to

your affectionate and faithful

friend and ſervant,

THO. LINCOLN.

Buckden, Oct. 28, 1684.

My honoured friend,

I RECEIVED yours, and this comes to bring (what is muſt due) my humble ſervice and thanks. It is an encouragement and comfort to me, that you do not condemn thoſe papers I ſent you. I confeſs you do judge rightly, when you ſay, that better and ſtronger reaſons might be brought againſt images (and ſetting them up in churches, and places of God's publick worſhip) from ſcripture, where God ſo often, and ſo ſeverely forbids the making of them for any religious uſe. And when they were any where made, he has ſeverely commanded to break them down, and utterly deſtroy them as abominable to God, and pernicious to the people, being teachers of lies. To avoid this our adverſaries do two things. 1. They have (with horrid impiety and impudence) put one commandment (that againſt images) out of the decalogue, where God himſelf had placed, and with his own finger writ it, which is an evident demonſtration, that their own conſciences convince them, that the ſecond commandment condemns their image worſhip; elſe it is certain, they neither would, nor needed they leave it out. But ſeeing this will not do their buſineſs (there being an hundred other places in *Moſes* and the prophets againſt images) they ſay, 2. That it is confeſſed, that images and worſhipping of them was abſolutely forbid to the Jews in the old teſtament; but it was by a poſitive (not any natural) law, which did bind the Jews then, but binds not us in the new teſtament, which is evidently untrue, as might, and (God willing) in good time ſhall be proved, for it is not a work for a letter. I ſhould only deſire our

Exod. xl. 4. Deut. iv. 12, 15, 16, 17, 18, 23, 25. Exod. xxiii. 24. Deut. vii. 5, 25. & Deut xvi. 22. Hab. ii. 18. Jer. x. 14, 15.

1 Joh. v. 21. adverſaries to conſider what St. *John* admoniſheth us; the word is εἰδωλα, which in our tranſlation, we retain, keep ourſelves from idols: which word properly ſignifying images (as the beſt gloſſary tells us) and their authentick Latin ſo renders it, *cuſtodite vos à ſimulacris*, keep yourſelves from images. I beg your pardon, and prayers for,

Heſychius has it thus. Εἴδωλον, ἐικόϊσμα, εἰκὼν, σημεῖον, &c.

Your obliged faithful ſervant,

THO. LINCOLN.

I SHALL ſhortly trouble you with another letter.

Mr. *Boyle* to the biſhop of *Lincoln*.

My lord,

THOUGH I ſuppoſe, that it is out of condeſcenſion, not curioſity, that your lordſhip is pleaſed to command my opinion in a caſe, wherein your very letter makes it appear, that no body is more fit and able to give a well grounded reſolution than yourſelf; yet I ſhall adventure to tell your lordſhip on this occaſion, that having lived in ſeveral popiſh countries, I was by the obſervations I made there very little invited to expect as much benefit as danger from the uſe of images in churches, eſpecially in ſuch where their very novelty may ſtartle many, if not ſcandalize them too. And ſince your lordſhip has the law and goſpel on your ſide, and knows very well the reaſonableneſs of that advice, *principiis obſta*, it ſeems a thing well becoming your ſtation and your wonted zeal for the purity of religion, to endeavour the early cloſing of a gap, that, left open, will probably be more and more widened, and prove an inlet to innovations dangerous to the church of *England*, and conſequently to the proteſtant cauſe. Though I write in much haſte, yet I dare not conclude this ſcribble, without giving your lordſhip a touch of the news I learned yeſternight. It is here taken for granted (and I think may be ſo) that the United Provinces will accept of the king of *France* his truce for twenty years, though the prince of O. be ſo diſſatisfied with it, that it is affirmed he has ſent for the princeſs to *Breda*, where he means to paſs this year. The French allow the emperor and the German princes a month's time, and the *Spaniards* ſix weeks to come into the treaty. But whether either of them will embrace the offer is not yet known. The Venetian preparations both by land and ſea are ſaid to be the greateſt, that ever that republick made, and the numbers of that foot (amounting to 16,000) together with that ſtore of materials fitted for building, make it ſuſpected, that they intend no leſs than to attempt the Dardanels, and fortify themſelves there. The king of *Poland* proceeds vigorouſly, and in likelihood will do it proſperouſly. The imperial troops in *Hungary* are not like to be reſiſted by an army, but only by garriſons. There goes a French letter, which I expect a ſight of, ſaid to be written by count *Teckely* to the pope, which ſome commend for a fine as well as real piece. We are told, that when his holineſs received an account of the miſchiefs the French had done in the *Netherlands*, and at *Genoa*, he led the cardinal *d'Eſtrees* to a fair crucifix, that was in the room, and falling at the feet of it, declared, with great earneſtneſs, that he had done all that lay in him to protect the Chriſtian church from the common enemy. But ſince ſome of her own children had, by their unſeaſonable animoſities, defeated all his endeavours, he humbly begged the divine founder of the church to take the preſervation of it into his own care, and then turning to the cardinal, added, that there was indeed one thing, that he might do himſelf towards the redreſs of theſe grievances. But though his unwillingneſs had ſtill made him forbear that remedy, yet ſuch extraordinary proceedings might neceſſitate him to employ it. For which we ſhall have the free conſent of,

My lord,

your lordſhip's moſt &c.

Buckden, Nov. 4, 1684.

My honoured friend,

I DID in my laſt threaten to trouble you with another letter, and this comes (with my ſervice) to do it. For I ſhall tell you a ſtory, which really troubles me, and will (I believe) not be very well pleaſing to you, or any who love truth, and our reformed religion. The ſtory is this. There is a book lately printed with this title: "The Order of the "Inſtallation of P. *George* of *Denmark*, *C.* duke "of *Somerſet*, and *G. D.* of *Northumberland*, "in the Royal Chappel at *Windſor*, April 8, "1684'." wherein we have theſe paſſages, as part of the form uſed at their inſtallation. 1. When the garter was given them, there was this admonition, "To the honour of "God, his immaculate mother, and to St. "*George* the holy martyr, gird on this garter, "&c." where, 1. By God in this form, God the ſon muſt be meant, for the Virgin *Mary* was not mother of God the father: and then our bleſſed Saviour, his mother and St. *George* are joined in the ſame honour. 2. The Virgin *Mary* is (moſt erroneouſly, againſt expreſs ſcripture) declared to be immaculate. Next we have this form uſed (as the book ſuits) at the putting on the George. "To the en- "creaſe of your honour, take this ribband "about your neck, with the image of the holy "martyr, and Chriſt's knight, St. *George*, "by whoſe aid you being defended, may "may have here the victory of your ghoſtly "and bodily enemies, and at laſt the ever- "laſting reward of victory." So by the aid of St. *George*, they may get the victory of all their

Page 3. of that book.

Page 4, and 9.

their enemies, ſpiritual and temporal, and at laſt eternal glory. This is not by obſervation, for I had it from a reverend and learned gentleman from *Newcaſtle* in *Northumberland*, who (before I had ſeen or heard of that book) gave me this account by letter, that the papiſts in that country made uſe of that book, to ſeduce ſome proteſtants to popery, telling them, that ſuch things were uſed, and approved in the king's chappel at *Windſor*, Hereupon the gentleman ſent to *Windſor*, to one of the prebends, (who had been his ſcholar in *Oxon*) to enquire, whether thoſe forms had been uſed at the inſtallation of thoſe three noble perſons, and found, that it was a Roman *pia fraus*, an impious popiſh fee, for no ſuch forms were uſed at the inſtallation, and complaint was made of it to my lord of *Canterbury*, who ſent for the printer, and will (I doubt not) ſee juſtice done. By the premiſes you may ſee, that there are deſigns on foot to bring in popery, not only in *Lincolnſhire*, by images at *Moulton*; but in other counties; and if we ſleep while they ſow tares, we neglect our duty, and give our adverſaries opportunity to do miſchief, which that our moſt gracious God (who neither ſlumbers nor ſleeps) may prevent, is the prayer of,

Your moſt obliged thankful ſervant,

THO. LINCOLN.

Buckden, Nov. 29, 1684.

My honourable and honoured friend,

I RECEIVED yours, and (with my humble ſervice) return my hearty thanks, for the great (and as I hope in that iſſue, it will prove good) news, concerning Mr. *Maimburg*'s book, and the buſineſs of *Genoa*. Both which will doubtleſs highly diſpleaſe the old gentleman at *Rome*, and is an evident argument, that the French king has little favour for his holy father at *Rome*, who may poſſibly (if he continue diſobedient) diſinherit his eldeſt ſon, and (what he has formerly done, I mean ſome of his predeceſſors have done) ſend an angry and roaring bull to depoſe him; though (at preſent I do believe) he dare not do it, conſidering the French king's greatneſs, who will (as our *Hen.* VIII. did) account the thunder of a papal anathema, no more than an *ignus fatuus*, or inſignificant ſquib, though thrown from the capitol. What the iſſue of thoſe animoſities will be, I know not; but leave it to that infinitely wiſe, powerful, and good God, who has, I believe (conſidering the ſtrange and great commotions in *Europe* and *Turkey* too) ſome great work to do in this weſtern part of the world, and (in deſpite of all human politicks and deſigns) will do his own work his own way (with infinite juſtice and wiſdom) for theſe is no power nor policy againſt his good providence. I cannot requite your kindneſs, by ſending you (what you ſent me) foreign news: yet give me leave to ſay ſomething of a new book, which came to my hand this week; the title this: "A Diſ-"courſe concerning the Meſſias, by *John Tur-*"*ner*, *&c.*" In this book the epiſtle dedicatory is more than half the book, and moſt of it againſt Dr. *Cudworth*'s Syſtem. I am told, that Mr. *Turner* was of Dr. *Cudworth*'s college, and by him turned out of it, *& hinc illæ lacrymæ*. 2. In the book it ſelf, pag. 63. he propoſes to explain the nature of God, and defines God to be, "an Infinite Extenſion or "Space. 2. He endeavours to prove (having poſitively affirmed it, in the lemma to his third ſection, pag. 80.) that *Des Cartes* was an atheiſt. I ſuppoſe he does not mean, that *Des Cartes* is a profeſſed atheiſt, ſo as to deny the being of a Deity; but that it will follow from his avowed principles, that there is no God; which whether it do or no, I have neither a mind, nor time to determine. However, one thing he has, which I approve; (and it is the trueſt thing in his book) he makes honourable mention of Mr. *Boyle*, pag. 77. which thouſands, beſides him, will do, when there is occaſion; and of that number he is one, who begs your pardon for this rude ſcribble, and ſubſcribes himſelf

your faithful friend and ſervant,

THO. LINCOLN.

Buckden, Oct. 1, 1685.

My honoured friend,

I HAVE received your letter, which (as all yours) was very welcome to me; not only becauſe yours, but for the good news, which you did ſo kindly communicate. I perceive, that the animoſities and differences between the French king, and the old gentleman at *Rome*, are very great; yet (as *Herod* and *Pontius Pilate* could, and did agree, to perſecute our bleſſed Saviour) they can agree to perſecute the poor proteſtants, with a barbarous, inhuman, and unheard of cruelty; which will, (I doubt not) haſten their ruin. For there is an infinitely juſt and good God, who ſees, and (in his good time) will puniſh the impious and cruel oppreſſors of his poor people. By theſe four theſes (you mention) ſo publickly approved and defended in the *Sorbonne*, we are furniſhed with a juſt anſwer to their common objection; "that our church having ſo "many differences and ſects (as preſbyterians, "independents, *&c.*) muſt needs be imper-"fect, as wanting an infallible guide and "judge to determine thoſe queſtions, which "(they ſay) they have." Now they have given us a juſt anſwer to this frivolous objection. For 1. Our differences are in things of leſſer moment, about government, whether biſhops, or no biſhops, whether churches be independent, whether the croſs in baptiſm, *&c.* But they (as appears by their theſes) differ in the very fundamentals of their church; the Jeſuits, Canoniſts, Caſuiſts, *&c.*

and generally all their writers have and do maintain the pope's infallibility, and his ſupremacy, even in temporals, that he has power to depoſe kings, abſolve their ſubjects from their oaths of allegiance, and give away their kingdoms to catholicks, that the clergy are not ſubjects to kings, nor can be guilty of treaſon, though they kill their king. Now the *Sorbonne* and the French divines deny all this, as appears by thoſe theſes. And indeed it is ridiculous for them, to object our little differences to us, when they have far greater amongſt themſelves. 2. But without them, we have anſwer ſufficient to that objection, concerning our diverſity of ſects and opinions. For that diverſity of ſects, and hereſies, and erroneous opinons, doth not ariſe from the want of (what they irrationally pretend to) an infallible judge; for while our bleſſed ſaviour and his apoſtles lived, there wanted not an infallible judge, and yet there were many ſects and erroneous opinions: which aroſe from the want of humility, faith and piety in the people, who would not (as they ought) ſubmit to and humbly receive thoſe divine doctrines, our bleſſed Saviour and his apoſtles infallibly taught them. 3. But the fourth theſis does utterly overthrow their whole religion; I mean popery, as it conſiſts in thoſe doctrines all proteſtants deny: which (God willing) I hope to make evidently appear in good time. In the mean time, I hope to be in *London* before the parliament ſit, and then (as heretofore) you will be troubled with

your moſt obliged friend,

and thankful ſervant,

THO. LINCOLN.

I CASUALLY got a fall, coming out of the chapel on Monday laſt, a little bruiſe of my hip, and a little pain followed; but (I bleſs my good God) the pain is almoſt gone. But it has kept me in my chamber (being not able to walk without pain) this four days. So that I was not able to wait on my good lord *Burlington*, who going through our town kindly ſent to ſee how I did.

Buckden, Thurſday, Jan. 14, 1685.

My honourable and honoured friend,

I RECEIVED yours, and this comes (with my humble ſervice) to bring my hearty thanks. My health (which you ſo kindly enquire of) is much better (I bleſs God for it) than I could have expected, my great age (79 almoſt complete) and the infirmities, which uſually accompany it, conſidered: only my ſhortneſs of breath is a weakneſs troubleſome, but (I bleſs God) not painful to me. I pity, and pray for the poor perſecuted proteſtants in *France*; I believe thoſe calamities fall on the good and bad, as the captivity on the Jews (in that excellent chapter *Jer.* 24.) and with the ſame difference. The wicked Jews were ſent into captivity, "for their hurt," ver. 9. but the pious Jews, "for their good," ver. 5. And I do not doubt, but the honeſt French proteſtants (though their calamity be great) will find thoſe great and moſt gracious promiſes made true to them, which are made to the Jews in their captivity, ver. 5, 6, 7, of that chapter. For the good men, *a patria exulant, ut ad Deum redeant.* The miſeries, which good men ſuffer, are not *ſupplicia*, but χαείσμαλα. They are not *pœnæ*, but *medicinæ*, intended and given for their health. They are *actus patris miſerentis*, not *judicis peccata vindicantis*, &c. And indeed, we evidently ſee, that thoſe poor perſecuted French proteſtants find great favour in all places, whither they come for protection and refuge. The French king's perſecution of his poor ſubjects, is not only unchriſtian, but barbarous and inhuman; and I doubt not, but as his ſin, ſo his puniſhment will be ſignal, even in this life. For the confeſſion of the Popiſh faith you mention, I ſend you one encloſed, as it was lately ſent me. The firſt part of it is the Conſtantinopolitan creed, the very ſame with that creed we have at our communion in our liturgy. The ſecond part is that we call the new Trent creed, which was never heard of, till *Pius* IV. publiſhed it at the end of the Trent council, anno 1564. Now the new Trent creed added to the old creed is a full comprehenſion of popery, where it is clearly and authentickly propoſed, without mincing and miſrepreſentations; and we have it ſometimes in the [a] Trent council itſelf, ſometimes, after the end of the council, as in many editions. Now in this new creed, every article is evidently erroneous, and many ſuperſtitious and idolatrous. I ſay, (pardon my confidence) evidently erroneous, ſuperſtitious, or idolatrous; and I doubt not, but it may, and (in time) will appear, that there is good reaſon and evidence enough for this confidence. Pray pardon this rude ſcribble of

your moſt obliged, thankful,

and faithful ſervant,

THO. LINCOLN.

Phil. i. 29. ἐχαρίσθη.

Heb. xii. 6, 7.

[a] See in the edition of the Trent council at *Antwerp*, 1633. Seſſ. 24. *De reformatione* pag. 450. which is the moſt uſeful edition for us in many reſpects.

Buckden, Nov. 22, 1686.

My honoured friend,

I RECEIVED yours, and (with my humble ſervice) return my hearty thanks for the news you did ſo kindly communicate. That which you write concerning the king of *France*'s diſtemper, is (to me) very great and conſiderable news. When firſt I heard of the French king's diſtemper, and the extraordinary quality and condition of it, and conſidered his unchriſtian, nay, inhuman and barbarous cruelties exerciſed upon the poor proteſtants (his innocent ſubjects) I did, and do look upon

upon his diſtemper, not as any caſual or ordinary diſeaſe, but as a puniſhment upon him, from the immediate hand of divine juſtice, ſuch as no human art can cure. *Raro antecedentem ſceleſtum ſubſequitur pœna pede claudo*: great ſins (even in this life) have uſually ſignal puniſhments; if not to better and reform the ſinner, yet to fright others from the like impieties. Concerning the French tract you mention, I am glad to hear, that a perſon of quality, and a Roman catholick (as they call them) ſhould write againſt tranſubſtantiation (a word never heard of in the Chriſtian world, for above one thouſand years after our bleſſed Saviour) and the doctrine ſignified by it ſo contradictory to the reaſon and ſenſes of all mankind, that I think it impoſſible for any to believe it, who "has not ſtrong delu-"ſion to believe a lie." And ſeeing the French clergy have ſo lately and publickly declared againſt the pope's power in temporals, his infallibility and ſupremacy, *&c.* it is my prayer and hope, that the good God of heaven and earth, who hath given them the knowledge of ſo much truth, and courage to profeſs it, will in his good time reveal to them thoſe other truths, which (by the church of *Rome*) have been miſcalled hereſies, and the profeſſors of them (with anti-chriſtian cruelty) perſecuted. If you could ſpare me the ſight of the French tract you mention, I ſhould ſpeedily and thankfully reſtore it. His argument, that tranſubſtantiation was not received and profeſſed in the primitive church, becauſe neither Jews nor Pagans ſpoke againſt it, is good, but not new; others have uſed the ſame argument, which (with many others, more cogent and evident) never has, nor can be truly anſwered. The money you gave me for the poor, I have diſtributed; and with it refreſhed about forty widows and fatherleſs, *&c.* And though they know not their benefactor, yet the infinitely good and gracious God, who gave you money, and (which is more) a mind to uſe it charitably, he knows, and can and will reward you. I beg your pardon for this rude, and (I fear) impertinent ſcribble, and your prayers for

your moſt obliged and

faithful ſervant,

THO. LINCOLN.

Buckden, Jan. 4, 1686.

My honoured friend,

I DO herein encloſed ſend you (with my humble ſervice) a paper, which (if you have not ſeen) may be not unworthy your peruſal. It is a letter writ ſome years ſince by Mr. *Walker* of Univerſity college, to a friend of his beyond the ſeas, who had heard, that he was inclined (if not turned) to popery, and gave him ſome reaſons againſt it. Mr *Walker* (as appears by his letter) confeſſes, that he is a Roman catholick, (as they love to miſcal themſelves) and gives his reaſon why he is ſo, naming ſome books, which he vainly conceives ſufficient to convince him of the truth of that religion. I do not wonder (the circumſtances we are now in conſidered) that he ſo lately declared himſelf to be a papiſt; but I wonder, that he did it no ſooner, but continued ſo long in the communion of the church of *England*; for he has been my intimate acquaintance above fifty years, and has ever been reaſoning with me for the religion of *Rome*. Though God knows, and all intelligent and impartial ſeekers of truth may and ought to know, that there is no reaſon for it, but the ſacred ſcriptures, and primitive and purer antiquity, expreſsly and univerſally againſt it. Our letters into the country from your great town tell us, that the French king is perfectly recovered, and in their churches thanks given to God for it; which is no part of the creed of

Your moſt obliged,

and faithful ſervant,

THO. LINCOLN.

WE hear nothing of the old gentleman at *Rome*.

Incloſed in the preceding.

Illuſtriſſime domine,

LITERAS tuas Martii 13°. *ſcriptas tempeſtivè recepi, ſolitâ humanitate plenas, et propterea mihi ſummè gratas et jucundas. Quod de me, deque religione mea, uſque ad vos permanaſſe dicis, cognoſcere non ſum ſollicitus; neque ad me reſque meas pertinere arbitror, quid illi ſentiant de me, qui, cum opus erit eorum auxilio, nihil prorſus ad ſalutem meam conferre poterunt, cum ſinguli coram divino tribunali ſiſtemur. Ecquis obſecro vel patrocinium, vel miſericordiam mihi præſtabit, ſi in religionis ſuſceptione quidvis errâſſe convincar? Dabis ergo mihi veniam, uti ſpero, ſi conſcientia propria contentus, aliorum ſive cenſuras, ſive rumores poſthabeam; neque decet, vel vacat decrepitum adeò ſilicernium fine ſua declaranda male feriatorum aculeis ſeſe exponere: abunde diſputationum ubique proſtat, et ſi cui libeat, dentes, vireſque ſuas adverſus eccleſiæ Romanæ catholicæ doctrinam experiri, paratos habet quos perpendat libros nunquam adhuc confutatos; unum cui titulus,* (The Guide to Controverſy) *anno* 1673, *ſecundò editum; alium,* Conſiderations on the Council of *Trent: alium Dr. Stillingfleet's* Principles conſidered, *ejuſdem libri adverſus* Stillingfleeti qualem qualem reſponſionem defenſio; *aliaque aliquammulta ejuſdem authoris. Quare, dum tantæ molis opera quaſi intacta remanſerint, mihi non imputabit notiſſimus tuus candor, ſi operam prorſus ſupervacaneam ipſe minimè conferam, neque ferram ipſe debiliter trahem, dum fortiora brachia otioſa reſtabunt. Quid Syrus ille tuus ſibi velit, fateor, ex iis, quæ perſcripſiſti, me non intelligere: videtur ſane adverſus Neſtorium, vel Eutychem nonnihil moliri, ſed contra doctrinam eccleſiæ, de reali ſervatoris noſtri in euchariſtia præſentia, vel panis, vel vini abſentia,*

abſentia, nihil eum aſſerere comperio: ſed quicunque fuerit, vel quicquid dixerit, modo de ejus authoritate non plenè conſtiterit, nihil ad me ſpectare arbitror; gratias tamen habeo, quod vel horum fragmentorum partem aliquam communicaſti, Deumque precor, ut tibi fælicitatem in hoc mundo, et æternam in futuro beatitudinem ex miſericordia ſua conferat, ut et ſervo tuo humillimo,

OBAD. WALKER.

Buckden, Jan. 19, 1686.

My honoured friend,

I RECEIVED your laſt, and (with my ſervice) return my thanks. A piece of news comes to us here from *Cambridge*, which ſome of that univerſity ſay is true, and may not be unworthy your knowledge. It is this. The maſter of *Sidney* college being dead, one *Baſſet* comes with a mandamus and diſpenſation (except for the oath of allegiance, that he muſt, and is willing to take) requiſite. But there happens this remora, which hinders his entering upon that government. The founder of that college has this qualifying condition and limitation of his donation; that whoever is choſen head of that houſe, ſhall be a true proteſtant of the church of *England*, otherwiſe that land given to the college muſt revert to the founder's executors. This (as well it may) does hinder *Baſſet* to take poſſeſſion of that hardſhip, being afraid, that the founder's executors will ſeize upon the land, as ſure (by law) they may be: for *donatio conditionata, conditione non præſtitâ, non obligat.* What will come of this buſineſs, time will tell. How your Roman catholicks (as they call them) come now to take the oath of allegiance, I know not: ſure I am, that *ab origine* it was, and ſtill is condemned at *Rome*, and unleſs the pope (*ex plenitudine poteſtatis*) diſpenſe with it, they cannot be good Roman catholicks, who now take it. I am,

Your obliged friend and ſervant,

THO. LINCOLN.

Buckden, July 28, 1687.

My honoured friend,

I AM returned to *Buckden*, and though the weather was very hot, and the ways duſty, yet (I bleſs God for it) in perfect health. I have received your letter, which was (as all yours are) very welcome to me, not only becauſe yours, but for the ſtrange and good news you did ſo kindly communicate. We in the country hereabout are full of prophecies and predictions, that *Babylon* muſt fall (which is not far off) the very next year 1688. That *Babylon* muſt fall, we have (in St. *John*'s revelation) an infallible prophecy: but that it muſt fall the very next year, our late prophecies ſay, but neither do nor can aſſure us. But if your news from *Italy* be true, as I believe it is, (*facile credimus, quæ volumus*) it may be (if not abſolutely certain) a ſignificant ſymptom, that the old gentleman, who has been long called (and not miſcalled) antichriſt, is not far from ruin. A kingdom divided againſt itſelf cannot ſtand long. The Gallican church (eſpecially of late) has declared againſt many of the papal uſurpations, and long received errors in that church, as fiercely as we hereticks, as evidently appears, not only by the publick and printed writings of their learned doctors, (*Richerius, Launoy, Du Pin*, &c.) but by the publiſhed declaration of the Gallican clergy aſſembled at *Paris* 1682. But now, if in *Italy* and *Rome* itſelf (the ſtate of the beaſt) there be riſen up a ſect of Quietiſts, (who as you well obſerve, are not likely to deſerve that name long) of ſuch numbers and quality; if Jeſuits be amongſt them; if the inquiſition (which had no inſtitution, nor till after the * year 1200 was ever heard of) be of divine inſtitution, ſuperior to all human authority eccleſiaſtical as well as civil: if they are come to that confidence, (or impudence) to paſs by the pope as ſuch, and conſult him only as a private perſon, as Odeſcalchi, not as Innocent; though in their fourth vow they have vowed to give abſolute obedience to all his commands, without queſtioning the lawfulneſs or unlawfulneſs of them, and though their whole Society has generally maintained his infallibility and abſolute ſupremacy: I ſay, if they are come to ſuch fatal diviſions amongſt themſelves, this overthrows the very foundations of popery, and is a ſignal ſymptom of the ruin of the papal monarchy, *quod faxit Deus.* But for the old gentleman and Jeſuits, *tranſeant cum ſuis erroribus.* For the money you concredited to me to be diſtributed amongſt the poor, I have comforted many poor people with it; and though you will not have it known, who is their benefactor, yet he, who ſees in ſecret, will reward you openly, and our bleſſed Saviour has aſſured us, that *merces charitatis magna erit et certa*, Mat. xx. 41, 42. Your prayers are deſired by, and for

Your moſt obliged, thankful,
and humble ſervant,

THO. LINCOLN.

Letters from Dr. Sharrock *to Mr.* Boyle.

Jan. 26, 1659-60. *New-College.*

Moſt honoured Sir,

I HUMBLY thank you for the trouble I gave you in the conveyance of my book to the learned doctor, and the inconvenience

* *Particulare officium inquiſitionis contra hæreticos non incepit niſi poſt annum milleſimum ducenteſimum. Vide hiſtoriam inquiſitionis Pauli Veneti: Roterodami* 1651. *p.* 10, 11.

you

you pleaſed to incur in the leaving your noble friends for the diſpatch of your laſt anſwer, but moſt of all for the matter of the anſwer itſelf. This day I conſulted Mr. *Robinſon* about the printing of your piece, the paper and character, and time requiſite for the work; who tells me, that the ſame letter for character is at Mr. *Hall*'s our printer's, wherewith Mr. *More*'s book you mention was printed: that two ſheets may weekly in that letter and paper be printed off, and for need more; the performance of which by Mr. *Hall* he will undertake for. As to the correction and reviſe of the preſs, I am already bound to give you my utmoſt aſſiſtance, and ſhall faithfully do it in your behalf, and ſhall queſtionleſs be able to do much more now for the fairneſs of the copies, than when lately I had preſs-work of my own; not only becauſe I ſhall have leſs work (for then the buſineſs of compoſing and tranſcribing was upon me) and a better preſs, but becauſe I ſee the danger of doing the whole buſineſs of the ordinary corrector by myſelf ſometimes, and other whiles truſting him to do mine. What I ſhall do as to the matter of printing, I ſhall look to it myſelf, and ſend you patterns of paper and letter, but act by Mr. *Robinſon*, becauſe I will have his care jointly with my own in the proviſions for printing, and his trade muſt be uſed in the diſperſing of the books, as it is in my own books, with whom therefore the profit muſt be divided, which, as is eaſily computed, muſt not be expected overmuch in 500 copies.

WHAT you ſpeak of the tranſlating of theſe experiments into Latin, is certainly moſt neceſſary and befitting the matter of the piece: and I aſcertain you of what you needed not to have beſpoke any help or aſſiſtance, that I may further you with herein, or in any other matter within my ſphere; and that either by myſelf, or friends, or both, according as your buſineſs, mine, or other circumſtances ſhall require. However, the perfection and compliment of ſuch tranſlation cannot be ſo made, as to be publiſhed without your own reviſe. My faithful humble ſervice to your honour being duly preſented, I reſt,

SIR,

your honour's in all dutiful

and affectionate obſervance,

R. SHARROCK.

DR. *Willis*, *Dickenſon*, and Mr. *Stahl*, preſent you with their ſervice.

April 9, 1660.

SIR,

IN return to yours of April the 7th, after my humble ſervice, this may confirm to you my intentions of abiding in *Oxon* this ſpring and ſummer by God's furtherance, and that I ſhall be willing to employ a very conſiderable part of my time upon any buſineſs you ſhall employ me. I have employed ſeveral hands in your tranſlation, but the variety of words and phraſes that occur proper to divers mechanical trades, and the whole matter being ſo different from that they are ordinarily converſant with (which is generally the vulgar philoſophy, humanity, and divinity) it happens, that after much aſſiſtance given them as to words and phraſes, their help is ſo inconſiderable, that in ſome I have been forced to alter every period in every ſentence. However, I hope and queſtion not, but this will be tranſlated for you ready for the preſs by midſummer.

AND, Sir, you are to conſider, that it is not very proper, eſpecially for me, that communicate the copy, to begin the tranſlation before the Engliſh be printed; and ſo the time of its being ſet forth will not be ſo ſoon as the Latin. The thing, that I ſhall willingly promiſe, ſhall be, that except only ſome ſtudies altogether neceſſary for me, which will not take up one half of my ſtudying time, I ſhall do no other buſineſs but yours in this overlooking the copy, the preſs, and rendring them in Latin. Though I ſhall notwithſtanding employ Mr. *Robinſon* to manage the copies as his own, and require for this grant not much per ſheet. Nor can I, when he ſhall only have five hundred to diſpoſe. I have here ſent one ſheet; the other is not come off the preſs to

Your honour's humbly devoted ſervant,

R. SHARROCK.

PRAY, Sir, ſend more copy.

SIR,

I HAVE long waited for this opportunity to give your honour an account of Mr. *Stahl*'s next courſe, in order to your lad's improvement in chemiſtry, which now in ſhort he gives me thus. That though he ſhall be employed by ſome doctors on particular buſineſs, yet he ſhall not go through any exact courſe till after Chriſtmas; and then he promiſes, if you pleaſe to ſend him, to make him operate with his own hands; which he cannot do now, the perſons, that employ him, requiring him to uſe their own ſervants. I intend, God willing, by *Moore* next week to ſend your honour a packet, therein to preſent you with (beſides a trifle of my own writing) ſome of your own more nobly penned and more learnedly written ſheets; and withal a pattern of that powder, which I diſſolved by diſtilled May dew. I have likewiſe encloſed ſent you the copy of our proceſs, wherewith M. *St.* made the aqua cochleariæ ſpiritualis. For, as I remember, you once mentioned a deſire of the ſight of theſe toys, if indeed the ſpirit of ſcurvy graſs deſerve no better name. I intend for the country, if the weather and my health ſerve me, the beginning of the next week, but muſt make it my moſt humble requeſt, that

that your honour would expedite the whole copy (as ſoon as it may ſtand with your honour's convenience) of the tract *of the Uſefulneſs*, &c. For the paper has lain by as long as the book would have been ſold in the time, it bearing the credit of ſuch an author. I hearken more to the requeſts of Mr. *Robinſon*, becauſe I know he will be a loſer by having this Latin book of the phyſico-mechanical experiments printed ſmaller beyond ſeas; though for that I have promiſed and intend him ſome amends. The tract of Uſefulneſs being for want of more copy laid by, I have lately ſet the preſs on work with the Engliſh phyſico-mechanical experiments, which they have promiſed ſhall perfectly be done by my return after Chriſtmas; ſo that it lies upon me to make a ſecond requeſt for the ſupplement, or thoſe other tracts you mentioned, which you thought would make the ſecond impreſſion of the phyſico-mechanical engine a competent quarto, in which volume it is now begun, that it may bear a part anſwerable to your other books. I intend not to return till the latter end of January, and therefore I ſet them on that printed (and upon my reviſe at the tranſlation exactly lettered and pointed) piece, becauſe they cannot err in my abſence; which they would do too frequently in your written copy, notwithſtanding all their correctors. I have put them in hope, that they ſhall have all their copy at my return. I leave it to your honour (ſtill with a proviſo for your greater occaſions) to maintain my reputation therein. The letter in behalf of Mr. *John Maſter* the adventurer in *Ireland*, to ſignify, that the bearer is the perſon, for whoſe caſe your deſired favour is expected here, if your honour pleaſes to encloſe it in a blank paper to Mr. *Edward Maſter*, ſenior fellow of New College, your honour will both oblige him and the humbleſt of your honour's ſervants,

ROBERT SHERROCK.

Jan. 29, 1667.

Noble Sir,

I THOUGHT to have preſented you with ſome of my medicated bread by the return of *Tho. Egerton*, which I made with ſcurvy graſs, ſage, or any other herb, and find it very uſeful, and a good way to prevent and cure divers of the chronical diſeaſes, that are common in this over humid iſland; but coming to me on the very day of his intended journey to *Oxford*, he finds me quite unprovided; and therefore promiſing your honour a taſt of more of theſe kinds than one, I write myſelf a debtor until ſome further opportunity. A thing that doth much good alſo in fits of the mother, and convulſions in children, and hath cured divers with us, is a mixture of a water made by diſtilling feverfew [matricaria] in ale, and the finer oil of amber: for want of which oil I many times uſe the tincture of amber in ℣. a few drops of either of which turn the diſtilled water into a thickneſs and whiteneſs like milk. I have uſed great quantities of this medicine with good ſucceſs both in women and children, and have cured perſons of all qualities with it, ſo that they have continued well for ſome years, and I expect every day to hear of more good done by it.

I ACQUAINTED you then, that I think the ſcurvy may be cured by turpentine diſtilled in balneo, *cum ſpecificis*, better than any other way. For the ſpecificks are feeble alone; and ſteel leaves an ill impreſſion upon the body, and drieth too much not without danger of the lungs. *Fonſeca* was the firſt man, that ever hinted it to me, but this way is naught: for the boiling turpentine to pills ſends out the ſpirit, that is more ſovereign. I diſtil it moſt gently, that the water may come as oily as I can, with as little oil as may be ſwimming, which I either ſeparate or not, according to the ſtomach of the patient. The falſe news I heard in *Oxford* concerning my lord, did at the ſudden and firſt apprehenſion ſo diſcompoſe me, that I have now a ſecond, that I made but a troubleſom viſit: for I remember I had then no thoughts but of him, not out of intereſt of my own; but I know his integrity ſo well, and his careleſſneſs of court, which moſt men regard ſo much, and value others by, that I thought it might be true. And conſidering, that I thought the world would think he had miſcarried, I fear I ſhewed ſo much concern for him, to whom indeed I owe much, that if I miſcarried in want of due reſpects to your honour, this apology I hope will be able to beg an excuſe for,

SIR,

your honour's moſt obliged ſervant,

RO. SHARROCK.

Horwode, April 7, 1668.

Noble and ever honoured Sir,

I WAS loth to let *Egerton* return empty to your honour; and therefore having no readier preſent, I have ſent four rowls of ſuch medicated bread, as we commonly uſe, and alter *pro re natâ*, as is uſual in medical beers. Theſe are made the eaſieſt way only by ſhreding the leaves, and moulding them in the dough: ſomewhat a finer way, when we have plenty of the herb, is, mingling the juice with milk, and making the dough therewith, or in herbs, that give no juice, as ſage, to make a ſtrong decoction in milk, or for a need in water, and make dough with it, though ſage bread is made very well this way. I have known ſage bread do much good in drying up watry humours; and when we have had infectious diſeaſes among us, we conceived this angelica bread to be of good uſe among us. Egrimony bread is alſo very pleaſant, and certainly a good epatick ſcurvy-graſs ferments

ments well in bread, but will retain its mucid taſte, that it hath in beer and in broths. Medicated beers I uſe as much, and I think it an error in phyſicians, that they preſcribe their alterated ales to be drunk too new, before they are defecated and made fit to penetrate. Aqua limacum, according to the receipt ſent to your honour, I find (I think) the very greateſt medicine, that is ſtilled in the veſica, which is a ſtill with me continually employed: divers gallons of that water have I uſed this year, with ſtrange ſucceſſes in all obſtructions, icterical, hydropical, ſcorbutical: for I am moſt for chronical diſeaſes, becauſe I ſee therein the power of a medicine: in the rickets I do all with medicated breads and beers, and ſometimes ſome doſes of my aquæ limacum. But I have the fault of phyſicians, I ſtick not punctually to receipts, but accommodate my preſcriptions to my materia medica. For what I preſcribe I give for the moſt part.

As for domeſtick or oeconomick uſes of chemical preparations, I will venture to commend this one, which I found out this ſpring. Coming to this houſe, that is an old houſe of ſtone, the cupboards, wherein the maids threw the foul table linen, were full of ruſty ſweating nails. Theſe gave that ſort of linen the iron-mold, and that linen gave it to all the reſt. For whatever an iron-mold touches in linen, when wet, it infects. After divers experiments, which we found either noxious to the linen, or unſucceſsful to the ſtains, I gave them a glaſs of oleum ſalis, which I had had by me ever ſince *Stahl* wrought with me: this being dipped on with a pencil, and laid a day or two abroad with the whitening clothes, took out the iron-molds and all other ſtains perfectly (without any harm to the linen) upon their being waſhed: nay, many ſorts of ſtains vaniſhed immediately upon their being touched with this oil.

I HAVE tried to hatch thoſe little pullets eggs, that are not above three quarters of an inch diameter, and have no yolks, but with ſuch ill luck, that I was not able to make any conſiderable obſervation. I ſhould have tried them in birds neſts.

I HAVE been lately conſidering the medical laws, in the book of Leviticus, and it ſhall be with me at leaſt *diſputabilis opinio*, that very many of them were intended to have a medical uſe, as well as a ſacramental or ſymbolical one. Our Saviour went about curing diſeaſes, or rather healing them; and why ſhould it be for the diſhonour of a lawgiver, to have regard to the prevention and cure of endemick diſeaſes? I will grant Mr. *Calvin*, (for that is moſt true and undoubted) that they were commended to the people, by being made ſymbolical alſo. But it is time, that from this digreſſion I ſubſcribe myſelf,

SIR,

your honour's moſt obliged ſervant,

RO. SHARROCK.

IF your honour have any ol. ſalis, or other medical matter, that you ſhall not uſe, "give, and it ſhall be given," and your honour ſhall be ſure to have an account of the ſucceſs.

Letters from Dr. Edward Pococke *to Mr.* Robert Boyle.

Oxon, Baliol-Coll. Oct. 5, 1660.

Moſt honoured Sir,

I MUST in the firſt place entreat your pardon for my great incivility, in that I have not written ſooner to you, to give you thanks for a book of your own excellent experiments, that I received from Mr. *Robinſon*, the ſtationer, by your appointment. But I deferred it, hoping, before this time, to have given you account of the finiſhing of *Grotius*. Though my own diſtractions be great, that I could not attend, as I deſired, the buſineſs (for whereas I had hoped, to have found ſome ſettlement here, I can yet find none, having ſtill to deal with thoſe, that are too hard for me, and keep me out of my right) yet I muſt needs caſt the blame of this delay on the printer, though he wanted not for calling on. I hope now, that by the middle of next week all may be done. In the ſixth book, I thought it neceſſary to put no other things for matter of hiſtory, than will be acknowledged by the Mahometans. And indeed *Grotius* himſelf was of that opinion. And therefore I have left out what is ſaid of the pigeon flying to *Mahomet*'s ear; and that the mouſe was bred of the camels dung; and that half the moon came into his ſleeve; and ſome few things are ſo altered, as that they might rather agree with what they themſelves affirm, than what others rhetorically deſcant on the ſtory. Sir, that acknowledgment, which ought to be made of your great good intentions in this work, I ſuppoſe, will be better ordered, ſo as to be put in with thoſe copies, which ſhall have the Latin bound with them, and be retained in Chriſtian countries, than neceſſarily annexed with the Arabick. For I think it will be better, that any, which ſhould be ſent unto thoſe eaſtern parts, ſhould go without any name or title of perſons or place, whence they come, leſt the good thereby intended might by ſome malicious men, under that pretence, be hindered. But if you pleaſe to order it otherwiſe, your commands ſhall be obſerved. Sir, I muſt crave your pardon for all defects, which will be found in the work. My deſires were to ſerve the church, and your noble ſelf: wherein I have failed, I hope your candour will impute it not to want of will, but ability. I crave leave,

Honoured Sir,

your moſt humble ſervant,

EDW. POCOCKE.

Oxon, January 3, 1660.

Moſt honoured Sir,

YOUR goodneſs hath emboldened me to ſend up to you this encloſed note, deſiring, if opportunity may ſerve, by your mediation to procure them from *Aleppo*. I have formerly written thither for them, but could never receive anſwer; which makes me deſire the aſſiſtance of your credit, which I hope may more prevail. The former are to be gotten from among the Jews, and by the hand of ſome Jew, with which ſort of people the Engliſh merchants there have continual negotiation. And I doubt not, but if any of them would make it a buſineſs, they might be procured, either at *Aleppo*, or from *Damaſcus*, or the like places. I conceive they are books, which might be much to the common advantage of that ſort of learning, more perhaps than thoſe, that ordinarily we have, which makes me much deſire them; and among the other parts of *R. Tanchum*'s book, that he calls Al *Biyan*, which are notes on the ſcripture; eſpecially his firſt part, wherein he hath *præmiſſa generalia* to the reſt of his work, and concerning ſuch things as ought to be heeded to in the interpreting of ſcripture. He often cites it under the title of כליאת or Generalia, in his other parts, ſome of which I have, and wiſh for that and the reſt. *Cozari* I hear is coming forth in Hebrew and Latin at *Baſil*. I wiſh therefore we could ſee it in Arabick, as it was by *R. Judah* firſt written. The latter two books, the titles of which I have written in Arabick, are to be had from the Chriſtians there. And I would our men could procure ſome other of their ancient books. We know too little of what is among them. Sir, I beſeech you, pardon this great boldneſs. I with more confidence beg it, becauſe my deſign is not for private but publick intereſt; yet, Sir, I ſhall look on what favour you do in this reſpect, as a great heightning of thoſe obligations (if they may be heightned) in which I ſtand engaged already to you.

SIR,

your moſt humble ſervant,

EDW. POCOCKE.

Oxon, March 13, 1660.

Moſt honoured Sir,

AFTER the receipt of your letter, as ſoon as I could ſpeak with Mr. *Clarke*, (for he was not then in town) I deſired him, that 200 copies of *Grotius* might be gathered by the printer, to be ſent up to you; and being then to go out of the town, hoped, that at my return, I ſhould have found them either to have been ſent, or ready to be ſent; but it proved otherwiſe; yet I hope to no diſadvantage, the occaſion for which his ſending them was delayed, being (as he tells me) that ſuch faults, as were eſcaped in the printing, might be mended with the pen. This day it is promiſed, that ſome ſhall go forward towards *London*, and others follow; which I hope will come ſafe to your hands, as the reſt alſo, when you ſhall ſee fit to have them thither. I ſhall, Sir, accept of your favour, in making bold with ſome few copies; and have made bold likewiſe to ſend incloſed ſome more papers, with the names of thoſe books, according to that courteous intimation in your letter; having added to the former one other grammatical tract of *Abu Walid*: as likewiſe *Avicen* (entitled in the Latin tranſlation *de Almahad*) *de reſurrectione*; which laſt may, perhaps, moſt probably be had at *Conſtantinople*. Sir, give me leave to propoſe to you, whether at the end of the Turkiſh Catechiſm, it may not be convenient to have the Lord's Prayer, and the Creed, printed in Arabick. I ceaſe at preſent farther to trouble you, and take leave, deſiring, wherein I may, to approve myſelf,

Noble Sir,

your moſt humble ſervant,

EDWARD POCOCKE.

I HOPE, Sir, that together with the books you ſhall receive a copy of *Tograi*'s poem, here printed, though not worthy your acceptance, yet as a token of unfeigned reſpects.

A BOOKBINDER, that promiſed to bind up a book or two in imitation of the Eaſtern manner, hath failed: but, Sir, if they be bound up either in leather or vellum, ſo as that they may open well, and little of the margin taken away, it may do well.

Oxon, Chriſt-Church, Dec. 2, 1662.

Moſt worthily honoured Sir,

IT was my unhappineſs in my ſhort ſtay at *London*, not to have opportunity of waiting on you. I made bold to leave at the lady *Ranelagh*'s a copy of *Gregorius*, Arabick and Latin, which I hope is come to your hands. If at leiſure you ſhall pleaſe to caſt an eye on it, and find it in any thing to anſwer expectation, your good word and approbation will help vindicate it from that contempt, which, with other men uſed to writings of another kind, it is likely to find. However, I doubt not of your favourable acceptance, and pardon of thoſe defects, which will be found in it. Thoſe, to whom the edition belongs, are yet in diſpute, whether they ſhall print ſome index to it; which being a matter of delay, and I having done (as I ſuppoſe) my work, I was willing it ſhould come among the firſt to your noble hands. Sir, I crave leave,

your moſt humble ſervant,

EDWARD POCOCKE.

Letter from Dr. John Beale *to Mr.* Boyle.

October, 4, 1661.

I HAVE lately overbuſied you about a character worthy the knowledge of greateſt ſecretaries: which, as at this time it is ſomewhat more ripened by my own experience; ſo I ſhall herein give you a clearer model of it. You did once well accept of a civil problem, which, in ſpecie, or by tranſcript, (at your own choice) you may pleaſe to communicate to my couſin *Pye*, allowing him to ſhew it alſo to Mr. *Sherwyne*, whom I do chooſe to be witneſſes, that I engage my reputation, and all that I am worth, for the full performance, according to every article ſubſcribed. The time was, when a great counſellor told to Mr. *Sherwyne*, that if my better employment did not forbid it, I had been fit to be a ſecretary, *&c.* Now I dare allow to aſk ſecretary *Nicholas*, whether he knows any man, that can go beyond this? I ſhall hereafter ſhew you, that I learned my art of no man.

A mnemonical problem, Nov. 4, 1661.

1. To deviſe millions of millions of characters, each one ſo apparently differing from each other, throughout the whole immenſe variety, that the eye at firſt glance ſhall diſcern and diſtinguiſh the difference.

2. In a mnemonical table, to appoint a diſtinct place proper for every diſtinct character.

3. By this mnemonical table, and the art thereunto belonging, to find, ſuggeſt, and provide the proper character for each peculiar place, and with ready apprehenſion of the proper importance of the character; which, for the moſt part, containeth a whole Engliſh word, a real matter or buſineſs.

4. To produce the proper character in the proper place, and in readineſs for every occaſion, accordingly as the immenſe variety of occaſions may be offered; and all this in a moment, or in a twinkle of the eye.

5. To deviſe for this performance characters all of ſuch eaſy draughts, that any ordinary ſecretary or clerk may at firſt trial be prompt in it, and engroſs them with diſpatch.

6. To deviſe, that theſe characters of ſuch immenſe variety may (notwithſtanding the variety) be printed with ſo much eaſe and facility, as ſhall only require (at moſt) double pains of other printing. [This I lay down for fuller caution of liquid truth in all points, being of opinion, that it may be printed with more eaſe, and far greater diſpatch, than other writings.] Of the one I am ſure; of the other I will call it but hope, till I ſee the trial.

7. To change the ſhape, and alſo the force of this character, and to vary it into millions of millions of guiſes, to prevent the treachery of diſcovery, as oft as occaſion or care of ſafety ſhall require.

To the clauſes 3, 4, 5, 7, note, that the characters are not written in the peculiar places of the table; for that would engage and fix the memory to thoſe characters alone, and thereby hinder the further uſe of the mnemonical table; or, at leaſt, foreſtal againſt that variety, which may be neceſſary to prevent diſcovery; but, which is far better, and more ſtrange, and, indeed, the main point of the ſecret, the characters are retained in the mind, and, in a moment, producible in fit order for any kind of occaſion.

All this, the reading, writing, uſe and practice, ſo the learner be willing, and of ordinary capacity and ſkill in clerkſhip, I undertake to teach with eaſe, due vacancies, and refreſhments, in one week. To this I engage my credit, and all that I am worth.

JOHN BEALE.

Feb. 25, 1662.

Honourable Sir,

I HAVE made thus bold with you, for which I begged pardon by Monday carrier in a ruder draught; for then I was conſtrained to force my Pegaſus to out-run the carrier's horſe. And thus we deal with God and good men all over. We beg pardon, and commit the ſame faults in the ſame breath. Now I am to acquaint you, that there are in my hands five very large parchments of ſtrange alphabets, titles, and notations, which Mr. *Hartlib* beſtowed upon me, as the device of *Caleb Morley*, who (at a great age) ſhewed the moſt wonderful ſpecimen of artificial memory, that was ever ſhewed, as I think. And the Engliſh court (for many years) ſaw the proof of it. But by his death (which was ſudden by a fall from his horſe) theſe rolls are laid aſide as unintelligible; and the art deplored, as irrecoverably loſt; or the author ſuſpected of magic. Now, by caſting my eye on the rolls, I am become confident, that I can interpret every line, tittle, and blot (for thoſe alſo are ſeveral kinds of mnemonical marks.) And I can point out, in which order every parcel is to be learned (for that is alſo no ſmall difficulty, and no remark left, by which we might diſcern, which roll is 1, 2, 3, 4, or 5.) And there are ſome blinds, which for ſome time my eye had not diſcerned; now I have found them, and know their uſe. And that theſe rolls were apprehended by Dr. *Goad* (then chaplain to the archbiſhop, and famous at *Dort*, a ſtiff and ſtaunch perſon) to be uſeful, may appear by theſe words in the cloſe of the laſt roll under his hand.

This alphabet, conſiſting of five pieces of parchment, and being a diſpoſure of vowels and conſonants, tending to an art of facility and method invented by Mr. *Caleb Morley*, and preſented by him to the king's majeſty, I have peruſed, and think it convenient and profitable to the purpoſe of the author, and therefore fit according to his deſire to be printed

printed and publiſhed by his appointment, and to his uſe.

THOMAS GOADE.

Croyden, Sept. 17, 1623.

SIR,

THIS I refer to your own private thoughts, not offering to engage the Royal Society in it. For I take notice what prejudice moſt learned men have againſt all diſcourſes of artificial memory; yet we cannot deny it the ſuffrage of the greateſt wits, that ever were; *Ariſtotle*, *Cicero*, *Quintilian*, *Aquinas*, *Muret*, lord *Bacon:* to theſe I could add hundreds. And I know, I could once boaſt of a natural memory beyond belief, but I found it true, that Mr. *Hales* foretold me, the firſt grey hair would ſignify the decay of it; and ſince I have had ſome regard and aid from ſome methods of artificial memory.

BUT above all in preſent I take notice what vaſt aid might be to the memory in the very printing of books that are worthy to be learned in the reading. And for this cauſe, I do account, that by our prints we are at ſome loſs in that we have omitted the beautifying letters, which in manuſcripts did very diſtinctly adorn the fronts of chapters and ſections. And other golden and fine coloured ornaments they had, which gave mnemonical remarks to main joints, and theſe were (in *Solomon*'s language) as ſtuds and nails to faſten the memorandum. Neither were they of old at ſo great coſt only to pleaſe children, as with painted babies. Therefore I am ſorry the Elzivirian and other excellent printers, have deſpiſed theſe beauties.

AND that you may ſee I have primitive antiquity, zealous fathers, and firſt eccleſiaſtical liturgies on my ſide for theſe and more ſacred uſes, I have herewith ſent you a tranſcript out of St. *Hierom*'s preface to the new teſtament. Which, beſides the flouriſh of the cut, may bring *Caneparius de Atramentis* in ſome requeſt for variety of beautifying colours. And though I love picture very much, yet this I prefer (for the ſubſtantial aid) before Mr. *Bloome*'s ornament. And this may be ſo deviſed, as to be no great charge nor much interruption to the preſs. And for ſome books, they deſerve (by a round value) to be ſo far guarded from proletary uſe. To theſe I would recommend the mnemonical characters of *Publicius*, and thoſe added by *John Pœepp* in his *Artificioſa Memoriæ fundamenta*. *Tu hujuſmodi alphabetum ex inſtrumentis à Publicio excogitatum accipito, ſed ſi ex benè feriatis fueris, ac hujus artis avidus, facilè proprio Marte melius formabis.* It is eaſy to propoſe variety of excellent and divine efficacy; and this can be no hurt to natural memory. Sir, I hope you will ſometimes give me leave thus to whiſper into your own ear, which I dare not offer to the whole body of the Royal Society.

Honourable Sir,

your vowed ſervant,

B.

Domino illuſtriſſimo Roberto Boyle, &c.

J. B. S. P. D.

I pete, muſa, virum, purâ qui mente colendus.
Quid tibi ſuffuſis ignibus ora rubent!
Tu mollis nimium, nimium licet ille ſeveri
Judicii cenſor, cum juvat, eſſe poteſt.
Non tamen arbitrium vereare ſubire faventis;
In caput haud ſtringet ſpicula dira tuum.
Dumque litas animi grati lætique lepore,
In te nil juris triſte tribunal habet.
Ex merito poſſit te quamvis ore verendo
Excipere, aut tetricâ ſpernere fronte levem,
Ille, nec officio dedignaturus amici,
Aſſeret amplexu, propitiâque manu;
Inceptumque tuum pacatâ mente fovebit,
Nec renuet, quamvis ſpargere es auſa ſales:
Non tibi, muſarum magnum decus, ilia adurit
Virus amicitiam ſuſpicione gravans;
Neve ſupercilium curvos confringis in orbes,
Cum mea ſunt manibus ſcripta recepta tuis.
Exul abi, timor omnis; habet ſecurus amator,
Quo ſua cuncta poteſt condere ſenſa, ſinum.
Cur ungues ſaperet demorſos, ter repetitis
Ante tuos tornis literâ trita pedes!
Artificem temnit limam, complexibus apta
Simplicibus, pulſat quæ tibi muſa fores;
Inque tui cordis penetralia rectius ibunt
Quæ ſubito fundam, nec meditatus ego:
Nec mirum eſt pedibus ſi ceſpitet illa, citatos
Quæ ſuperat curſu læta Thalia notos.
Vatibus ætherеus juſtis exundet oportet
Spiritus, et pleno Nectar in ore fluens.
Mene mihi novoſi gyaris compreſſa Lycæi
Sic reſpirandi geſtit habere vicem.
Tu quoque quid ſenium primis accerſis in annis!
Verna quidem lux eſt anteferenda nivi.
Lætitiæ comes eſt riſuſque, jocuſque, Venuſque,
Ipſe Cupido puer, nudaque trina Charis:
Triſtitiæ comites, livorque, horrorque, furorque,
In cædem et rutilis anguibus acta ſoror
Vos, O rectores populi, queis cingitur auro
Frons Auguſta, oris vos prohibete minas.
Hinc lites, hic inſidiæ, nec ab hoſpite tutus
Hoſpes, ubi eſt luctu fas violare lares.
Ille ſuis fatis injurius, ille benignis
Ingratus, cui non ampliat ora lepos.
Invidus et patriæ, qui ſeclo debita nondum
Agnoſcit Britonum gaudia fixa ſolo.
Ecce et adhuc magnas durat conventus, abeſte
Quotquot in his damno creditis eſſe locum.
Pallet Iber, trepidat Gallus, caput improba Roma
Dejicit, et lentè coccina longa trahit.
Nunc licet amoto ſordes velamine totas
Cernere, nunc oculis ulcera nuda patent.
Debellata ſuos faſtus jam ponit Ierne,
Viſque infida, ultra nec recidiva, cadit.
Jamque Tago uberiora tument æraria regi,
Nunc et opes Indus fundit uterque ſuas.
Hoc qui contractâ meditatur fronte, malignus,
Credatur, legum fulchra ruenda ſtudet.
Te quoque ſeraphicos tinxiſſe lepore calores
Æterno agnoſcet Lindamor obſequio.
Nec minus aptus eras vel in aere prendere pondus,
Et quibus anguicalis urget ubique ſolum.
Sic, ubi perpetuis conduntur vellera gyris,
Arctè comprimitur, qui petit ima, glomus.

Quis modus et quantum eſt auræ vitale, et inane
Quid velox, ipſe oculis per tua vitra probas.
Igni ad aſtra licet pernicibus avolat alis,
Spargit et eoos heſperioſque ſimul,
Siſtis, et arte tuâ proprios affigis ad uſus,
Ne ſuperet juſſum deſtituatve tuum:
Omniaque ex omni extorques elementa elemento,
Nec manet exuccus, te prohibente, cinis.
Quidlibet ex quovis, opifex divine, recudis,
Si non materiam ſuggeris, ipſe facis.
Ornatu polles ſophiæ, virtutis, et artis,
Nulla tamen frontem ruga moroſa fodit.
Clara Bovylorum proles, ignoſce fatenti,
Majus es, et noſtris viribus impar onus.
Succumbendum igitur, ſed in hoc mihi gloria reſtat,
Quod fari nequeo, mente animoque colo.

E cæno Somerſetenſi, Feb. 25, 1662-3. *Tui obſervantiſſimus,*

J. B.

Yeovell, Somerſetſhire, Sept. 28, 63.

Honourable Sir,

I HAVE in my heart an ambitious deſire to render you ſome acknowledgments of your favours; but I have no language for it; and am under many reſtraints, which ſeem to forbid it. For if I ſhould expoſe my apprehenſions, I ſhould not gratify, but rather afflict your countenance, and mine own alſo. And though we may and ought to make the largeſt of our offerings to God for his wonderful works, yet I am not certain, that we may give due applauſe in the ſame fulneſs to any mortal; but that we ſhould much rather bleſs God for the gifts, which he hath given to men; and make a right uſe of ſuch bleſſings, as he communicates by human aids, for our ſelves, neighbours and poſterity. Sir, in your behalf I praiſe God, who taught you in your childhood to offer to him the beſt of ſacrifices, far better than innumerable hecatombs; and then for putting it into your heart, to aſk for that wiſdom, which he was pleaſed to grant to you; and then for enabling you, in the firſt bloſſoming of your youth, to inſtruct the wiſeſt, how they alſo may offer a like acceptable offering to the father of all wiſdom; and in a factious age to direct all diſſenters to the moſt reaſonable liturgy. And now you have exemplified to the living, and to all poſterity, how they may receive from heaven into one center, and communicate to each other, all the obliging beams of nature, grace and art; and how we may heal our animoſities, verbal quarrels, diviſions, and diſtinctions, by freely taſting of the pure fountain of all good, and by freely diſtributing what we have freely received; that we neither divide the author of all graces from the author of all good arts and natural operations, nor divide ourſelves about fruitleſs verboſities.

BUT withal, Sir, you cannot forbid me to be much raiſed in my heart, to find ſuch univerſal obligings to condeſcend to particular and perſonal favours towards me. Yet I ſee I can do no better than ſome devout cowards, who ſay, that their prayers gave good aſſiſtance for the victory, which was gotten by other men's valiant atchievements.

BEING thus far at a loſs (till I was better directed by a ſurpriſing kindneſs from you on Saturday) my beſt and intended deſign of gratefulneſs was not unlike a poor man's ſhift, in *Cambridge*, who, finding himſelf unable to pay Dr. *Winterton* for his medical care of him in his ſickneſs, beſtowed by legacy his body on the doctor, for the beſt payment he could make. And our later experience (from lord *Bacon*'s advertiſements) confirming, that the anatome of the living is more inſtructive than of the dead, I began to make haſte, whilſt I drew breath, to give you the beſt and fulleſt inſpection, that could be deviſed, of my moſt reſerved phyſiognomy. And truly, I think, that kind of medical aid is ſomewhat wanting. For if perſons, that have ran many hazards of life, by various diſeaſes or ſickly complexions, ſhould ſhew their abilities herein, as faithfully as I was willing to ſhew my affections; this would ſometimes explain ſome of the cauſes, why many medicines prove ſo feeble, and would diſcover many ſpecifical medicines, which are not yet vulgarly known, eſpecially if arrived to my years, which are ripened under the proverbial dilemma of a phyſician, or a fool. Being alſo many times brought to the Elyſian borders by conſumptions, that affrighted the doctors; and ſometimes by unſatiable fevers and chronical inflammations, for many years together, becoming a fit engine, on which (as on your pneumatical glaſs) you might receive an anſwer to all your demands, and ſee viſibly the difference of all waters, drinks, diets; and remark all correſpondency of parts, how by outward applications to operate on the entrails; how by inward reliefs to allay outward griefs. And, I believe, you would accept of this ſervice, if it were offered by a more happy hand, as from ſome acute perſon, whoſe ſpirit held a more intelligent correſpondence with the more elementary parts of his body throughout. And truly this was in my thoughts, when I communicated ſtudies with our moſt ingenious virtuoſo Mr. *E. Waller* at *Beconsfield*, when he had a full family, a wife, himſelf, his mother, Mrs. *Tomkins*, and his other ſiſter, his niece *Crooke* (now the lady *Speke*) all complaining againſt the winds of the ſpleen; yet moſt of them ſurviving to confirm my paradox, that a Venice-glaſs, by ſuch aſſiduous and careful preſervation, may laſt as long as a ſtrong Mazor chalice. And I have oft-times obſerved athletic and ſturdy perſons, by a puff of furious air, blaſty vapour, or poiſonous fog, and a diſtemper thereby wilfully acquired, and obſtinately neglected, ſent haſtily to their graves, whilſt others (far more faint and feeble) have taken the firſt touch, as a ſeaſonable advertiſement for their eſcape, or cure. But this argute employment were fitter for the happy pen of your acute neighbour Mr. *Waller*, than for my dullneſs.

SIR, I fear I have tired you already, before I have made anſwer to your commands. And now I can only promiſe to give you a weekly trouble with ſome of the rudeſt rudera, which, in the beſt of my hopes, may poſſibly ſome of them ſerve in that ſylva of promiſcuous experiments, upon which you may diſcharge ſuch of your papers and informations, as are impertinent, or ſupernumerary for your other arguments in hand. And it is almoſt neceſſary, that ſuch a work ſhould be rejoined to your phyſiological eſſays, which were abroad by *Herringman*, 1661. And I have a ſolicitouſneſs, that *Daniel* (who is both a Londoner and Cantabrigian) ſhould receive ſome of your commands for the publick. His character is very fair. And it ſomewhat pertaineth to the advance of political conduct. For there you have a fair regiment of diſciples. And, though *Oxford* be your right hand, yet why ſhould not you uſe your both hands in ſuch a noble work?

SIR, I do heartily wiſh you very much happineſs, but not much reſt from theſe your troubles, theſe half hundred years.

S I R,

your moſt entire, and

truly faithful ſervant,

J. B.

OF mnemonicals I muſt give you a fuller account, when you can be at more leiſure.

Sept. 29, 1663.

Τα Μνημονικα.

SIR,

OBEDIENCE is better than ſacrifices, the beſt that my poor fold can yield, Therefore my firſt regard is to your commands. You require animadverſions, ſupplements, and chiefly mnemonicals, I begin with the laſt.

IT is a very trifle, as if it were to make pins, and place them in rows, or wire cards for the clothiers; which, without the right art, is an ugly hard work; and the art itſelf is but a ſlight and contemptible device.

IF you ſhall pleaſe to examine what *Ariſtotle*, *Cicero*, *Quintilian*, and *Aquinas* have written, with great wit and diligence recommending the art, and ſpecifying all the parts of it, you will find it conſiſt of as few and ſimple elements, as does the Turkiſh muſick; two ſtrings, or three at moſt; two notes, or three in all. *Ordinem eſſe maximè, qui memoriæ lumen afferret*, ſaith *Cicero*, from his own experience, and, upon the authority of *Simonides*, *Itaque iis, qui hanc partem ingenii exercerent, locos eſſe capienaos, & ea, quæ memoria tenere vellent, effingenda animo, atque in his locis collocanda; ſic fore, ut ordinem rerum locorum ordo conſervaret, res autem ipſas rerum effigies notaret, atque ut locis pro cerâ, ſimulachris pro literis uteremur.* Theſe few being all the parts, and theſe being ſo argutely illuſtrated by thoſe four forenamed leading wits, ſo fully and moſt elaborately by *Quintilian*, there remains nothing for any ſober man to undertake; only the practice is our part and duty; and that is indeed the ſum total.

AND truly, in my childhood, I found, that all the art was a kind of clock-work, or wheel-engine, as *Ariſtotle* deſcribes it. The joining of ſpring wheels, and other parts of the watch, in ſuch coherence, that, by the touch of any part, the whole and every part may be put in motion, and yet all in order.

AND by reading *Ovid*'s Metamorphoſes and ſuch ſlight romances, as, the Deſtruction of *Troy*, and other diſcourſes and hiſtories, which were then obvious, I had learned a promptneſs of knitting all my reading and ſtudies on an everlaſting ſtring. The ſame practice I continued upon theologues, logicians, and ſuch philoſophers, as thoſe times yielded. For ſome years before I came to *Eton*, I did (in ſecret corners, concealed from others eyes) read *Melanchon*'s Logicks, *Magirus*'s *Phyſica*, *Urſin*'s *Theologica*, which was the beſt I could then hear of. And (at firſt reading) by heart I learned them, too perfectly, as I now conceive. Afterwards, in *Cambridge*, proceeding in the ſame order and diligence with their logicians, philoſophers, and ſchoolmen, I could at laſt learn them by heart faſter than I could read them; I mean, by the ſwifteſt glance of the eye, without the tediouſneſs of pronouncing or articulating what I read. Thus I oft-times ſaved my purſe, by looking over books in ſtationers ſhops; and good reaſon, when I grew to the maturity of diſcerning, that much more was publiſhed under great names, and high pretences, than was fit to be recorded. Conſtantly I repeated in my bed (evening and morning) what I read and heard, that was worthy to be remembred. And by this habitude and promptneſs of memory I was enabled, that when I read to the ſtudents of *King's College Cambridge* (which I did for two years together, in all ſorts of the current philoſophy) I could provide my ſelf without notes (by mere meditation, or by glancing upon ſome book) in leſs time than I ſpent in uttering it: yet they were then a critical auditory, whilſt Mr. *Buſt* was ſchoolmaſter of *Eton*. This was no more pains, than to empty the honey into the combs, which are prepared ready. And to him, that conſidereth, how every perfect reader devours the whole period in a moment, before he can pronounce the firſt ſyllable with true emphaſes, it will be no ſtrange or incredible matter, that one ſhould ſtring up any diſcourſe, and ſort it to known topicks, and provide appendent topicks for novelties, with an undiſturbed diſpatch.

IN theſe beginnings, I accuſed my memory as much as any man, as defective for ſtrange names, words, alphabets and languages, not fully underſtood; but obſerving how, in the prints of thoſe days, the names were printed in a bright Roman print (all over the pages liquidly diſtinguiſhed from the black Engliſh print) I reviewed them apart, and learning them

them in order, made ſuch as I had learned a kind of topicks, to aſſiſt me in the learning of the reſt, and made them and the paragraphs the handles, on which I did hang the particular branches of the ſtory.

THUS by the alphabet conſiſting of few elements, and thoſe having their compartitions or reſts upon the vowels (the leading letters linking their formations into ſyllables, as they fell out to be one, two, or more ſyllables) I found a regular aid, which afterwards would indifferently ſerve for the farther acqueſt of any words, names, or ſtrange language; and the ſpirit delighting in order, relations, parallels, ſimilitudes, and novelties, I did daily learn the names of places, perſons, or things, ſo as to annex them always to ſome former impreſs; which renewed the former impreſſion, and ſecured the new. And thus, by impreſſing the Parcæ, Cyclops, Furies, Charites, Muſes, Sybills, *&c.* their names, ſignifications, order, and number; one faſtned another, and gave encouragement for the like promptneſs in other like matters.

OF theſe and other mnemonical matters I gave ſome account, by way of long letters and eſſays, to Mr. *Hartlib* ſome years ago.

I. IN ſome of theſe eſſays I obſerved the miſtakes of ſome, who blame their memories, without juſt cauſe.

II. IN others I ſpecified, what eaſy and obvious aids many, that complain of this want, may acquire; always (by particulars) exemplifying the peculiar aids and occaſions, by which ſome were eminently famous for vaſt memories, and how others became notoriouſly defective.

III. In ſome I diſtinguiſhed the art, habitude, or promptneſs of taking a quick and deep impreſſion of arts, notions, or languages, to retain all firmly, from the verſatile activity of rallying, or calling to order and rank, backwards or forwards, names or things, whether before known, or unknown, at firſt or ſecond hearing.

To obviate a little of this for further illuſtration, I will here put down a few of thoſe propoſitions.

I. To the firſt, I note, that ſome blame their memories, when they did not take care enough to give a ſufficient charge to their memories, nor a due depth of impreſſion; as when the wife forgot to advertiſe her huſband to avoid an ambuſh; had ſhe had a due care and tenderneſs for her huſband's life, it had wrought ſtrong enough on her fancy, to warm all the blood about her heart to attend her huſband's ſafety. In many ſuch caſes, the default is more from ſtupidity and dulneſs, or careleſſneſs, than from want of memory.

2. SOME commit the truſt to outward and falſe aids, that are irrational, and cannot move, rather than to their own ſpirits and imagination, which is always active, ſtirring, and at hand. Thus the thread tied about the finger, or ring, may deceive, if the care of tying did not help the impreſſion; and thus topicks and common places in books, and not in the brain, may make a learned dunce. And for this cauſe, men ſhould take heed of engroſſing in table-books, what they ought to learn by heart, except it be with purpoſe to take it off the table-book into the memory. Otherwiſe they may find *Plato* as true as an oracle, Μεγίση δὲ φυλακὴ τὸ μὴ γράφειν, ἀλλ' ἐκμανθάνειν, ἔ γὰρ ἐϛι τὰ γραφέντα μὴ ἂν ἐκπεσεῖν. *Fieri enim non poteſt quin ſcripta nobis excidant.* That learning is our own, which we carry about us, and out of the reach of fortune. He that truſts to his table-books, more than to the tables of his mind, hath tempted his fancy to be treacherous or lazy; and is referred to his book in the hour of his need. And hence are ſome ſhepherds and clowns better provided of memory, than ſome more promiſing doctors.

3. SOME excellent wits blame their memory, when it is their nice and hotſpur fancy is in fault. Let me name Mr. *Waller:* when we communicated ſtudies at *Beconsfield*, he told me, that he could not truſt his memory with the Lord's prayer, or a benediction for the table; yet I then admired his prompt ſagacity, both for elegancies of language, and for depth of matter. And ſince thoſe days, the greateſt aſſemblies of *England* have found his harangues impregnable, and the politeſt wits do find enchantments in his poems. His caſe was this. He rode on a winged horſe, Pegaſus, whoſe flight was ſo ſwift and fervent, in a progreſs for freſh acqueſts (as the bees on mount *Hybla*) that he could not endure to taſk it, or to fetter it upon repetitions of known things. Or it was the curioſity, delicacy, or niceneſs of his ſpirit, which did rather conſtrain him to blank his mental tables, than to leave there any records, that were not choice and ſingular. And this in calmer ſtile was the caſe of Dr. *Andrews*, and other very profound perſons. And every man's memory is ſo near of kindred to his own ſpirit, that it is generally fit and proper for the engagement of his fancy and affections.

4. SOME do blame the fickleneſs and unconſtancy of their memory. They confeſs, they can recover frequently, but not at call, nor in time of need. It is the caſe of a well-ſtored ſalter, or merchant, whoſe wares are not placed in order; or he ſeldom in his own ſhop or warehouſe. His ſtore confounds him, when the fair comes.

So that memory firſt bears the blame for the faults of a dull apprehenſion, which ſhould be awakened by intereſt or concernment. Or, ſecondly, is weakened by the charge and truſt; of which, by oft miſcarriages, we ſhould take warning. Or, thirdly, by a hot and heady hand, which does ſometimes fire the limbec with too much haſte for the extract. Or, fourthly, by mere negligence, and can never be cured, but by aſſiduity and diligence.

II. To the ſecond, For eaſy and obvious aids. It is the firſt rule, that whatever is not offered to the memory upon very eaſy terms, is not duly tendered. For fancy is the receiver and impreſſor. And that is a coy and humorous faculty. It muſt not be ſurcharged with

with violence, or obtruſion, but gently, by degrees.

2. WE ſhould affect, and inwardly glory in the improvement of our own minds, and lay up there every valuable advertiſement, as fitter to adorn our inſides, than frontiſpieces, walls, and paper books.

3. REASON ſhould wait the moſt acceptable ſeaſons of diſſuading fancy from the adventures of Phaeton, and offer ſome entertainments in the moſt pleaſing review. And yet here the fancy (to poet, orator, or other compoſers) is to be allowed much freedom and curioſity. For he, that does not love to ſing, *avia Pieridum peragro loca nullius ante trita ſolo*, but permits his memory to be ſo ſtiff, as to give us the ſame (though from the beſt inſpired writers) rather than the reſult from his own alembec, his ſtomach is bad, and his egeſtions nauſeous. I mean, when he undertakes as a compoſer and penman.

4. LET every man love his own home, and adorn his own Sparta, and find ſeaſons to put his own ware in order, before he oppreſſeth himſelf with a greater burden. And by ſorting his ware in fit places, he may find in theſe immenſe chambers room and fit places for much more, that henceforth may be produced at command. And a little at ready call, in time of need, is better than a great deal out of reach, or unuſeful. I knew an induſtrious ſtudent (his name was *Deans* and *Combe*, too) he ſtudied dictionaries, and had them by heart; but another, with a few hundreds of words, would have written better than he, both in proſe and verſe. For uſe and practice enables us to have our wardrobe at full command. Every poet and orator finds, that when his ſpirit and imagination is heated, he hath ſuch a briſk power over all his new and old notions and readings, words and conceits, and ſuch variety throngs upon him (beyond his own expectation) that he is conſtrained to confeſs inſpiration. To help memory, we muſt not attempt to mend divinity.

5. THE memory of words, names, and unknown language, is indeed a nicer needlework, and too like the primer's art; and it ſheweth and requireth the ſtrongeſt vigour and firmneſs of a natural memory, as the perception of the ſmalleſt object requireth the cleareſt eyeſight. And when the cells of memory are replete with phlegm, or debilitated with age, then we remember nothing, but long ſtories; and we have need of table books to regiſter the names of our friends and acquaintances. In this caſe I refer to the phyſician and his elixirs, which may quicken frozen, benumbed, and blunt fingers to handle ſmall needles, and ſuch ſmall particles. Of this (which nature is capable of receiving a remedy) I have offered a touch of ſupply already, and ſhall further proſecute it in the following diſcourſe. And no man will deſpair of a fair progreſs in it, when he ſhall ſee all imaginable formations of ſyllables and words reducible to a few heads, in a facile and obvious order, and in a brief model, at one view, as in my following deſign; eſpecially when the ſtuds or nails were engrafted in our childhood, as is the alphabet generally to all that know letters. And when memory is at the worſt, in decay, we remember thoſe younger days better than the laſt hour that paſt. And the ſmalleſt ſyllable may ſometimes, in ſome language, ſignify the biggeſt of creatures. And fancy is as ſpeedy at her work, as any ſpider, to tie the ſmalleſt particle to a thread long enough to make a clue for all the folds of any labyrinth. And it is a great help to a decaying memory, if we frequently review our firſt impreſſions in any matter of art, knowledge, or experience. And theſe will be the beſt topicks, upon which we ſhould hang all our later memoranda. It is as the riveting and better faſtning of the boxes and pegs in the ſhop and warehouſe.

6. IT is a great help to memory, if we accuſtom ourſelves to ſearch every thing inquiſitively, as if we would find out the moſt immediate individuation, and all circumſtances. My mother (after eighty years of age) was very famous for an incredible memory. Many would reſort to her, to enquire of old matters; but that was a kind of deluſion, ſince all of us do remember the affairs of our childhood beſt, but yet to me it was very ſtrange, that ſhe ſhould ſo exactly remember all things from her infancy. At all conferences I made ſecret trials many hundreds of times to ſtart up queſtions, which I gueſſed might never be diſcourſed by her to others, and ſhe would always immediately (and with ſome pleaſure to have it renewed) give me anſwer as freely and punctually, as if it were then before her eyes, although it ſeemed not to be revolved in her mind ſince her childhood, almoſt I might ſay infancy. But in her (and in others of extraordinary memory) I noted two things: 1. She would deſcribe every thing by perſon, place, order, poſture, motion, ſo as (if it related to any perſon) to deſcribe the perſon by figure, ſtature, voice, tone, and dialect in any humour, that might be ſingular or remarkable; and ſhe did always take deeper impreſſion, and more of the character of every perſon, than others commonly do. This may advertiſe to take in every circumſtance, as ſo many ways to ſecure the impreſſion, and to make a ſmall particle bear a bigger book. 2dly, I oft-times obſerved, that her account was generally, according to the firſt information that ſhe received, becauſe that made an over-deep impreſſion. She would not eaſily yield to a ſecond fame, though ſometimes it might have more of truth. And this may advertiſe to practice a little the art of oblivion, which in due place may be more worth than memory.

7. AND hence I arrive to this paradox, that ſome to help their memories muſt begin (and make haſte) to forget. He that would form a block or ſtone into the image of a breathing man, muſt with his chiſſel cut away much of the ſuperfluous matter. No wonder that he cannot write legibly in ſuch table books, as are all filled with ſcrawlings. Let him wipe all off, and then engroſs what is fit to

be recorded: and fancy will never fail to provide freſh tables with alacrity.

8. AND to this note I may rejoin, that, when theſe combs are once put in order, you can never ſurcharge them with honey. The more we acquire, and the more often we viſit and employ memory, the firmer and ſtronger we find it. For example, if I began in geography, and (after the rules of longitudes and latitudes) ſhould remark ſome few of the grand partitions in *Africa*, *Aſia*, *Europe*, *America*, and the Polar Iſlands; the more I advance in the knowledge of more provinces, and rivers, mountains, *&c.* the more I do faſten and ſettle my firſt rudiments, by entering my new ſtore; for to find the fit place, the mind hath ſtill ſome glance of view upon the whole, and particularly upon the recent ſupplies. And hence, by order and degrees, do ſome men become ſo learned to the admiration, or beyond the belief of others. And without thus much of the art of memory, no man ever became famous or found in any kind of uſeful learning. And ſome by this art have become univerſally learned in a far larger compaſs than the old reputed encyclopedy. Thus our *Selden*, *Grotius*, *Salmaſius*, and other learned men, by continuing their progreſs ſecured their poſſeſſions. And thus others, who do now addict to the more obliging and better inſtructive experimental philoſophy, though their matter and object ſeem as infinite, endleſs, and immenſe, as all God's works, and all the ſecret and wonderful curioſities of God's workmanſhip; if they ſhall accuſtom to raliy their ſtudies in any order of nature, conceipt, or received method, their progreſs cannot burden, but aid their memory. Yet in this, the felicity of method, as it does more ingratiate the conceipt, may be the greater aid. For example, if a man has fifty or an hundred buſineſſes, or affairs, to a fair, and ſhall think to direct and ſecure himſelf by the tale or number, he will find himſelf much perplexed; but if he firſt reduceth theſe hundreds to ſo many heads of uſes (and all things in art and nature are primarily or ſubſequently for the uſe of man, and will anſwer *cui bono:* if the provender be for the horſe, the horſe ploughs, harrows, or carries goods, or the maſter, friends, *&c.*) and ſubdivides every uſe, with the remark of concernment, and the loſs, that oblivion may cauſe, this will give fulleſt ſecurity for the main, and may be branched from few heads into ſuch clear order, as cannot be a burden. And now it is not the ſtring on the finger (which may be itſelf forgotten) but the places that muſt be viſited, and the perſons, who muſt be enquired, which are the fitteſt objects for remarks.

WHEN I hear a ſervant famous for remembring innumerable mercate errands, I do not diſdain to enquire his topicks, and remarks; and by enquiry I do oft-times make him more perfect in his own art, than he was before, or than he was aware of. And thus alſo by enquiring the method of every ſtudious perſon (for every intelligent hath a method) we revive, and confirm his memory, and lead him to make reflections upon his own art.

9. I HAVE ſaid it already, but will urge it as a freſh rule, that every man's ſtudies and buſineſſes are his moſt proper topicks for memory; eſpecially being in their own elements, and employed according to their affections. And though many learned men do not diſcern in themſelves, or do not acknowledge any art of memory, yet this is their art. For example; if one ſhould make a very conſiderable diſcourſe of mathematicks to a mathematician, of hiſtory to a hiſtorian, of chemiſtry or other experimental philoſophy to an experimental philoſopher, will not either of theſe in their ſeveral arts remember much more, than any perſon of the beſt memory, that naturally can be, if deſtitute of all art, order, or elements, in any of theſe arts? And every of theſe is more apt to remember, by how much the more he hath his own art in perfect method. My uncle, Sir *William Pye* (ſometimes attorney in the court of wards) was famous for his memory: his lectures were in great eſtimation, and attended with great reſort: beſides his great ſkill in the confuſed maſs of our voluminous and cobweb laws, they that were moſt intimate with him do report, that he could name every Engliſh gentleman (yeoman too would ſome ſay) his anceſtors, pedigree, coat of arms, their chief manſions, and other revenues. Being ſometimes a follower of the judges in their circuits, pleading in all courts, and, at laſt, for many years employed in that office, which made ſearch into all eſtates; he was well feed to remember names, families, and eſtates, and the coat of arms was a farther remark to guard the name in firm cogniſance. As oft as I waited on him, he would diligently enquire, whence, through what towns, by what houſes of note I paſſed? and could better deſcribe my way, than I, that had ſo lately viewed it. This was the practice of his memory.

10. IT is good to lay the ſtrongeſt foundations for a vaſt memory upon the ſenſes. It is one of lord *Bacon*'s rules, (and in all mnemonical writers recommended) *Deductio intellectualis ad ſenſibile*. I never loved fairs, being too weak to bear the crowds and joſtlings of men; yet I have ſometimes walked over great fairs, and entered many ſhops, with little welcome; for I had more of the mind of *Diogenes*, to ſee how many things I had no need of, than to buy. Now having a family, I have another ſecret end, to ſee how many accommodations may aſſiſt frugality. But my mind and chief aim was to practiſe my memory, in recounting all particulars in all places as I ſhould be demanded for trial. And in this kind our experimental inquiſitions have the advantage. When Mr. *Langley* was ſchoolmaſter of *Glouceſter*, I met him at *Kiderminſter*, where, with much affection, he led me along with him into all ſhops of ſuch artificers, as were not in *Glouceſter:* this gave me ſome initiation to attend to artifices and

mechanicks. And what memory can eaſily forget what the ſenſes have entertained? Yet the fancy will aſſiſt the impreſſion of ſenſe, and exalt to a deeper apprehenſion than outward ſenſe. I believe I felt a deeper wound, when I ſaw a man's ſkull trepaned, than he, that ſuffered the ſurgeon's operation. To aſſiſt the practice of memory, I had once deviſed a hundred ſtories, as pertinent to that purpoſe as I could ſuggeſt, and had engaged captain *Taylor*'s brother to furniſh me with 100 comprehenſive pictures, that might introduce, or allure; but his affairs preſently altering, my notes were thrown into a chaos of waſte papers. Another may hereafter do it better. And *omne tulit punctum*, whoever hath built the treaſury of all arts, knowledge and languages, for an entertainment, as in an open ſummer-houſe, to refreſh us in our walks and paſtimes. *Tredeſcant*'s ſhop may be a model.

II. To diſcover how ſome impreſſion is deeper than from ſenſe, I can ſpecify, how conſcience hath rouſed up the memory to do wonders. My youngeſt ſiſter (now living, as I hope, near *Cambridge*, the widow of that judicious *Cradock*, who was chaplain to his late majeſty) had in her very young years ſome blame from us for neglecting her books of devotion: but, as ſoon as her own ſpirit felt the check in deep earneſt, on a ſudden ſhe had all the Bible, and many other devotional books, ſo perfectly by heart, that ſhe was indeed a wonder. In that horror of her conſcience, every word of the ſcripture ſounded louder within her, than all the vaults at *Delphos*. It is beſt to receive the oracles of God with ſuch deep reverence, as if we entertained them for the oracles of God; thouſands of other ways may occur to engage the memory to a perpetual practice, and that does all the wonder. But now I muſt haſten,

III. To the third point of diſtinguiſhing memory; and this is not an eaſy matter, nor for every capacity.

1. FOR who can exactly diſtinguiſh, when the memory is naturally good, and when ſo only by induſtry, habit, practice and art? for we ſee, that the ſhepherd, who excels the doctor, had uſed, truſted, and employed his memory, more than the doctor. And ſome men have naturally ſuch a rational, and well proportioned fancy, as will receive, and lay up in this ſtorehouſe, in better order, and better for command, than others perchance, whoſe brains, or mind, have a firmer retentive faculty. And who will aſſure us, how much ſway the agent intellect, or fancy, doth bear over memory? or how much ſhare they have in the eſſence or ſubſtance of memory? If we attribute divinity to this agent intellect, or to memory, (as ſome of the acuteſt ſchool-wits, both Chriſtian and Mahometan, have done) what ſhall we ſay of the memory of dogs, and other animals, who (if we trace their ſagacity) may ſeem to challenge us for the better memory? I am ſure, I have oft-times truſted more to my horſe and dog, than to myſelf, for the remembrance of my way. The kindneſs and unkindneſs of millions of perſons, with a remark of every individual favour, they will remember a long day, and put it to the teſt of their noſes, whether this be not the ſame perſon, that did the injury or kindneſs; and I never ſaw them miſtaken in the reſult, though ſometimes they diſlike another the more, for ſome reſemblance or affinity in approach to the enemy. To be brief, I muſt call that a good natural memory, which is apt to reduce, and lay up all things in order, ready for all occaſions; and to deviſe images fit to make a laſting impreſſion.

2. THE practice, that hath been hitherto encouraged, is fit and proper for buſineſs, and for ſcholars, to acquire eaſily and ſpeedily, and to retain firmly and indelibly. And ſince all men have not the ſame capacity, nor the ſame firmneſs of memory, *metiri ſe quemque ſuo modulo ac pede verum eſt*; no man can damnify himſelf by this art, or by his frequent practice upon order and image, or impreſs. But let us keep ſome bounds in all the ſerious perambulations of our minds. He, that hath no true reliſh of harmony, in muſick, verſe or proſe, may well betake to ſome other employment; (for what hath a blind man to do with colours?) but that man, who is not in ſome capacities accommodable to human ſociety, is degraded below the beaſts and dulleſt inanimates. It is a ſad ſoul, who, by this mother and nurſe of all diſciplines, may not be expert in ſome uſeful profeſſion. And this art (as thus far recommended) is ſerviceable in any condition. The natural aptneſs firſt mentioned becomes more apt by theſe practices.

3. THERE is a farther art of memory, or (it may be I ſhall be required to call it) a higher degree in the prompt uſe of the art of memory. For all this makes not an orator ready to repeat his adverſary's unexpected arguments, nor to enable to the performances of *Anthony Ravennas*, mentioned by *Sabellicus*; or of the Corſic youth admired by *Muretus*; or of *Terentius*, *Skenkelius*, and *Morley*, more lately. I anſwer, that theſe few rules regarded, and the memory made vigorous, by morning and evening examinations, and thoſe old inſtructions recorded by *Quintilian* reduced to practice, in thoſe two points of regular place and image, will enable for truer wonders, and more valuable, than thoſe named in the late examples: of which kind of abilities lord *Bacon* ſpeaks contemptibly in his Advancement of Learning, both in Engliſh and Latin, l. 5. c. 5. And how can we juſtify ſo much waſte of time, to the only purpoſe of raiſing wonder? And what a trifle it is, to repeat words, alphabets, and ſyllables, *in infinitum*, if compared to that, which our famous lawyers do daily perform before our eyes, even when they do not ſo much as diſcern, that their memory is aſſiſted with any art, but only by practice? Generally all Mr. *Buſt*'s ſcholars, that were of the higher forms in *Eton*, (and ſo I believe it was in other chief ſchools) could almoſt at a glance of the

eye

eye learn about a ſcore of *Virgil*'s verſes, or a larger portion of *Cicero*'s orations. And for the interludes of Chriſtmas, without intermiſſion of our daily exerciſes, many did learn volumes for the ſtage, in very few days. My ſelf, who had then no other ſenſe of art, than in the foregoing clauſe I declared, nor could boaſt of any peculiar verbal memory, did, in a few days, learn every line, that is put in the mouth of *Æneas* by *Virgil*, in all his Æneids; and acted it ſeveral times before Sir *H. Wotton*. And I embrace this occaſion to applaud action, as a peculiar help to enliven and ſtrengthen memory: and hence, from experience, I can anſwer fully, that ſo much of theſe funambulary tricks of memory (as lord *Bacon* calls it) as may be of any commendable uſe, may eaſily, and by theſe two rules, be learned.

IN the laſt place I muſt relate, how Mr. *Hartlib*, having received ſuch of my eſſays upon the art of memory, ſent me his whole ſtore of mnemonical books, and, in a large letter, gave account of Mr. *Morley*'s very incredible performances. In following letters, I preſſed him to all particulars concerning *Morley*, as far as he could give me any anſwer; only he told me of a ſcroll of parchment, which he bought in *Duck-lane*, that it was *Morley*'s, but ſo unintelligible to all mortals, that he had caſt it amongſt his waſte papers. For a view of this ſcroll, I ſolicited ſome weeks, or months, before he could be at leiſure to find it out. As ſoon as he ſent it, at firſt caſt of my eye, I ſaw it was a very coſtly and elaborate model; containing between 40 and 50 feet length in parchment, engroſſed in a beautiful hand, ſubdivided and glued into five rolls of differing importance, viewed, examined, and approved, by the teſtimony and ſubſcription of Dr. *Thomas Goad*, a very ſober and acute perſon, and with royal countenance of higheſt applauſe, recommended to all ſchools, as Mr. *Hartlib* farther ſignified. Dr. *Goad*'s teſtimony imported, that he underſtood the accommodableneſs of *Morley*'s contrivances. And Dr. *Goad* was himſelf famous for many literary peculiarities. And, by peruſal, I ſaw how to interpret his contrivances, titles, remarks and defacements, at leaſt, by gueſs, and to mine own ſatisfaction. And now it is time I ſhould acquaint you, how much farther I have advanced. Being encouraged, and frequently preſſed on, by the importunity of Mr. *Brereton*, to explain thoſe rolls, and to proſecute that argument, I determined and proceeded as followeth.

1. I INTEND, God willing, to leave thoſe rolls, and all the mnemonical books, and other accounts of that art (which Mr. *Hartlib* ſent me) in *Greſham* college, for the uſe of the Royal Society.

2. THE books (as I take it) are all out of print, and the beſt of them never were printed for common uſe; but, being publiſhed by the chief maſters of the art, were by characters ſo intricated, that the maſters might not loſe the gain by the common ſale of them; the beſt of them is ſo anonymous, that Mr. *Hartlib* could not tell the author, or the publiſher. I would part in preſent with any of the books to be publiſhed, which by the annexed keys may eaſily be done by any academical corrector. But, for me to make collections, or new methods of the ſame thing; it were but *actum agere*, and the world is too full of ſuch folly. Yet I ſee great cauſe to wiſh, that in all univerſities there were profeſſed and able teachers of the art of memory; as there ought alſo to be ſuch as did well teach the arts of rhetoric, oratory, action, as did *Roſcius* and *Æſop*. What I have ſcribbled in theſe letters, is aloof or apart for the moſt part from what I find in the books of art. And I ſee three or four books of memory are already abroad in Engliſh, perchance with ſmall applauſe, and to little behoof.

3. I HAVE depoſited *Morley*'s rolls for a time in Mr. *Brereton*'s cuſtody, and Mr. *Hartlib*'s accounts of it; to this end, that he may enquire, whether he can find any perſons, that will undertake the explication.

4. I HAVE, in haſty ſcribbles, made offer at ſome explication; and this alſo I have debarred from the view of others, upon the engagement of Mr. *Brereton*'s word, which I know he does highly value. This I leave in his cuſtody, and yet bind from others eyes, that if another interpreter undertakes it, it may be compared, how far in our gueſſes we do agree.

5. HEARING by Mr. *Hartlib*, that *Morley* had a ſecret key, or more portable breviary, for the uſe of his larger contrivances, which was deplored by Mr. *Hartlib*, as the main myſtery, and irreparably loſt, I have exemplified, how thoſe contrivances may be abbreviated into ſmall manuals, and for more eaſy practice.

6. SINCE practice does all the wonder, and is all the difficulty; to eaſe the burden of practice, and to inſinuate the art and habit unawares, I have deviſed a mnemonical character (of which I formerly acquainted the honourable Mr. *Oldenburg*, and other noble friends) by the uſe of which character only, as for cryptography, one may ſoon get a facility in ranging all imaginable formations of letters, ſyllables and words, ſo as the memory, *tanquam uno intuitu aut nutu oculorum*, may, without labour, view and receive them, in whatſoever poſſible form or order, fancy or occaſion may ſuggeſt, alter, or rank them.

7. I EXEMPLIFY, how the uſe of that peculiar cryptography does perform lord *Bacon*'s deſign, touching helps for the intellectual powers; and may, by an immediate tranſition with the ſame, or like operation, ſerve for an univerſal character.

8. I URGE, and ſhew, how by the ſame proceſs the ſpirit is enabled for a promptneſs in the acquiſition of languages: in which operations nevertheleſs any man may decline the tumbling tricks of the mind and memory, reproached by lord *Verulam*, or take them in his way as he pleaſeth.

To reſume the *pinners rows*, all the operations is a trifle; neither have I any zeal for the character, as cryptographal, or univerſal; or yet for the mnemonical aid, otherwiſe than complicately, ſo as the one may ſuborn aid to the other, and both may envigorate the activity of the mind to a very uſeful promptneſs. Neither ſhould I ſpecify all the uſes or powers of it, but in due places: for if I ſhould open my utmoſt aim, no man will look upon it as feaſible, but gueſs it to be *obſcurum per obſcurius*, and the help to be the greater burden. And ſo it will be indeed, if the faculties of the mind be not raiſed, ſtrengthened, and habituated to it, by a very gentle and orderly proceſs of degrees.

From *Yeovill*, Oct. 2, 1663.

Honourable Sir,

HAVING tired you with long congratulations, and myſelf alſo with that and other ſcribbles on Monday laſt, I had thoughts of giving you more reſt at this time. But on Tueſday morning I drank your health in a doſe of eſſence of balſam, by which I was inſpired with ſtrength to undergo your commands for mnemonicals: and when you have ſeen what is here drawn, and what lies in other hands waiting for a fewer hours of your leiſure, I hope you will rather ſay, I have done too much and ſuperabundantly, than too little and defectively. This is in my heart my own judgment upon the matter.

BUT I cannot deviſe, how you ſhould peruſe my ſcribbles, for I have neither ſtrength nor leiſure either to compoſe or to tranſcribe; and ſince I reviewed my haſty draught, I find ſo defective expreſſions, as are uncapable of any other help than your pardon. If this were of ſo much worth, I would intreat, that the amanuenſes would prepare it fitter for your eye or ear before you afflict yourſelf about it; and then if you ſhould think fit to commute theſe ſheets for ſome writings, which are now in the hand of my honoured friend Mr. *Evelyn*, theſe letters and thoſe writings will mutually aſſiſt for the explication of each other to you both. And I humbly deſire, that neither may be much ſpread abroad, till they have received the laſt hand, and the ſeaſon be ripe and fit: and beſides (in theſe) you will find ſome domeſtical ſtories, though to honeſt purpoſe. I reſign all to your prudence and conduct.

BUT you may interrogate, why and how I can give ſuch full applauſe (as in the beginning of thoſe ſheets I do) to *Quintilian*, and others of the ancients; and yet offer for the publick more of theſe writings, either thoſe I have in my cuſtody, or mine own. To this I may anſwer, that libraries had long ago been empty, if that rule had been obliging, and in force; and I doubt we ſhall never leave off the rank humour of adding even to the oracles of God, till the creſcent ſword makes us more humble, and more reaſonable. But my better anſwer is, that modern maſters in the modern expreſſions do beſt agree with the modern times. And alſo I conſider, that there was more care and pretence to the art of memory in former days (as appears by the remarks, ornaments, rubricks in manuſcript, and by mnemonical caſes fitted for arts) but there is much more of the art itſelf (than we ſeem to be aware of) in uſe in theſe days, as appears by our progreſs in all kinds of literature. For though he takes no notice of it, yet every linguiſt, before he can be perfect in many languages, gets in mind ſuch topicks, as are moſt proper for the acquiſition of languages, by which he does afterwards get more of like kind with ſuch facility, that he advanceth with more eaſe and ſpeed; and in a ſerious purſuit of other deeper knowledge (upon the by, and with imperceptible diverſion) gets more languages daily.

HOWEVER, there is great force in this, *Qui monet ut facias, &c.* For every man, that reads a book himſelf, finds himſelf in ſome degree apt to turn to the page, where he found novelty and excellency, or diſguſt, and ſome (by a ſmall ray of their ſpirit) will turn with the finger to the place, *tanquam aliud agendo*, whilſt their more ſerious thoughts are otherwiſe employed. But, if upon advertiſement, they fix and accuſtom the memory, to take the firſt impreſſion of the title, chapters, ſections, method, and paragraphs, and peculiar remarks of pages, by this precaution and habit, they may find their memory much more vivid and firm.

BUT to prevent in you, and Mr. *Evelyn*, and other friends, ſuch great expectations, as do ſoil my ſpirit, and clouds my endeavours, I do often inculcate, how ſlight the means is. For example, it may ſeem incredible, or ridiculous, to engage the memory in a prompt uſe of one hundred and ſix thouſand diſtinct places for alphabets, ſyllables, and words; but in practice it will be but two eaſy operations, which a young factor will ſuddenly catch up in an hour or two, being aſſiſted by a common ſlight of the eaſieſt part of arithmetick, the characters being reduced (by coloured lines of partition) to a brief view of one page in 4to. For twenty times twenty makes four hundred: and (in the ſame manner of operation) four hundred times four hundred makes a hundred and ſixty thouſand. So like it is to the making and rowing of pins: he, that can make and row one paper, finds no other work or difficulty for as many characters as he pleaſeth. And twenty letters may ſuffice for an alphabet. Or if, for curioſity, he would practice upon *Morley*'s alphabet, which (to take in the ſounds of all the languages) he made thirty, by multiplying thirty times thirty, it comes to the ſame manner of operation.

SIR, *Comenius*, to expedite pedagogy and didactics, wrote a large folio, which he ſent me, and hath ſince added many more volumes: but I thought it better to adhere to my old rules, than to begin with this folio.

I muſt

I muſt not commit the like error; if a very few rules, and a ſheet or two exemplified, does not ſerve this turn, I ſhall have nothing to ſay. For the world is already oppreſſed with didactical books. It may be you have heard of one *Hercules*, who of late years in ſome parts of *Germany* taught all ſorts of people, men, clowns, and plough-boys, all the learned and devout languages, in few weeks, by practiſing their memory upon a roll, which he turned by ſcrews upon a table, for which he was arraigned as a magician. If I undertook pedantry, it ſhould be my ambition to prefer ſuch brevity before huge volumes. Example is the beſt teacher; and performance a ſufficient proof and demonſtration, as you have thoroughly taught us in your excellent philoſophy.

SIR, I cannot be very well pleaſed with any of theſe firſt draughts, being haſty work, (and that man muſt be very fantaſtical, who gives not ſome precedence to his ſecond thoughts and riper judgment, before his firſt conceits.) But I am ſo much unſatisfied and diſpleaſed with the third ſheet on the top remarked 3, that if in the whole there be any thing worthy a review, I muſt humbly crave the favour for the return of that ſheet for a chaſtiſement. I hope to give a clearer diſtinction both of natural memory from artificial, and of the art, which is the treaſury of all arts and ſciences from that, which pretends to the wonder. Let me put a note of reduplication upon that, which you do well know: you know ſome, that are ſo perfect in many languages, that they would bluſh to be told of any phraſe, idiom, or almoſt of any authentical word (in any of thoſe languages) to them unknown; the ſame perſons to be in a like degree prompt in all hiſtory and geography, and many other arts, ſciences, and voluminous writings, as are ſome, that have the truſt of great libraries; no expreſſion poetical, or rhetorical, no notion ſeems new or ſtrange to them: I ſay of ſuch memories, which muſt have more of art, induſtry, and practice, than of nature, and yet much alſo of an inquiſitive reaſon, of an impreſſive conceit, and of a ſerene and firm mind; that they are highly to be preferred before thoſe quick returns of memory, which are ſo much admired. For what is it to tire all the company with repetitions of words and ſentences (if it ſhould hold out for ſome hours, days, or weeks) in compariſon of this art, which heaps up, digeſts, and firmly retains whole libraries? In my poor deſigns, I have offered aids of both kinds, but chiefly to the firſt, and collaterally to the ſecond, as far as any man ſhall pleaſe to concern himſelf in it.

BUT, Sir, all this is but a kind of pedantry, and very much below your affairs. God willing, in my next Eſſays, I ſhall endeavour to ſerve you in your more noble and publick engagements. For though no man can make leſs luſtrous proof of it, yet I aſſume the confidence to aver it, that no man living can more deeply and more ſincerely honour you, than

Honourable Sir,

your moſt obliged ſervant,

JOHN BEAL.

Oct. 17, 1663.

Honourable Sir,

I AM now under your commands for animadverſions: but I muſt firſt interrogate. Can your commands juſtify any ſuch attempt? Or will you bid a man demoliſh temples, and deface ſhrines and monuments? To ſay truth, you may ſafely bid envy try her teeth upon ſuch marbles and diamonds. For they came from the heart of the beſt rock; the ſubſtance is all divine, and the foundation divinity itſelf: and he, that ſhall aſſault a perſon for vindicating God's glorious attributes, and the intereſt of mankind, (and with ſo much luſtre and ſolidity) he muſt be guilty of theomachy, and renounce humanity.

SIR, the deepeſt of theologues ſay, that we want the ſame hand, and the very ſame method for the reſtoration of theology; and we cannot ſpare your labours for philoſophy, till our ſafe paſſage for heaven be ſecured. And ſurely we had never ſo far divided, and daſhed againſt each other upon pretences of purer Chriſtianity, or of holy truth, if we had adhered conſtantly to that theology, which is operative, practical, and experimental, according to the ſafe and liquid rule of ſhewing our faith by our works. Now by our lofty flight in logical or rather ſophiſtical terms, and ſchool-notions, we have loſt the foundation, and cannot agree, where to find the old plain and Chriſtian faith, which was heretofore always pregnant of good manners. Our king *James* had the applauſe of learned *Caſaubon*, and other judicious reformers for this ſound ſentence, *Pauca illa ſunt, quæ abſolute neceſſaria ſunt ad ſalutem, et fere ex æquo omnibus probantur, qui ſe Chriſtianos dici poſtulant.* We proteſtants do ſay the holy ſcriptures are full and clear; the Romaniſts (notwithſtanding all councils, ſynods, and ſchool-decrees) give us comfort in our implicit faith, and blind obedience. And as well the prophets of old, *Micah* vi. 6, &c. as the apoſtles, *Heb.* viii. 8. have abbreviated for us in very fair and legible characters, which are alſo engraven in us: yet like *Jacob*'s ſons we fall out on the way, till by this breach we do at laſt loſe our way in ſad earneſt. Sir, you are by divine endowments conſecrated a chief in that prieſthood, which is bound to offer ſacrifices to heal theſe tranſgreſſions. And thoſe great diſcoveries, which God in late ages hath made, not only by great effuſions of beams and light of art and nature, but alſo of that holy light of the grace of reconciliation, may give us many grounds of good hope, that God makes haſte to finiſh ſome great work in a more glorious diſplay of ſo much of his luſtre, as is fit for this world. In which notion I indulge

I indulge no more, than was modeſtly undertaken by *Bodine* ſome years ago in Meth Hiſt. c. 7. *Confutatio eorum, qui quatuor Monarchias aureaque ſæcula ſtatuunt*, where he ſhews, that it is we and our poſterity, that are of the golden age.

BUT you expect I ſhould deſcend to particulars, and I muſt remember, that I am under the authority of your commands, which puts me to the diſtreſs of ſuggeſting, how calumny may frame ſome argument againſt you.

FIRST then, page 59. though you ſpeak very warily and timorouſly of the immenſe perfection, and therein equality of the divine attributes, and our φιλαντία hath a very juſt check, I can move in behalf of ſome tender or curious ſpirits, that you would vouchſafe to ſecure that paragraph with a marginal note, as a double expreſs, that you acknowledge God's mercy to be his great and moſt obliging attribute, not only as our neareſt concernment in the great myſtery of the goſpel, but as extended in chief over all God's works, which were created all very good, but by our tranſgreſſion were rendered under a curſe. For you may juſtly urge, that as our revolts and tranſgreſſions were the ſad occaſion of the emergencies and ſupereminences of the attribute of mercy; ſo by our redemption and reſtoration, we are ſingularly bound to offer the ſacrifices, which are due to God by the claim of all his other attributes, and particularly for his framing, creating, and governing the world, and all parts of it in ſuch perfect harmony. For the works of creation are not eclipſed and darkened, but illuſtrated by the reſtoration, *&c.* In this caution, you may decline ſome endleſs diſputes, which ſharp men do daily raiſe, how the attributes are diſtinguiſhed, which are eſſential, and wherein the prerogative, *&c.* In which the greateſt wits may ſooner loſe themſelves, than clear all points to others; and a wiſe man ſaid too truly, that the Jewiſh ſuperſtition at the name of God was leſs faulty than our preſumption upon the nature and attributes of God.

SECONDLY, *ad pag.* 62. It is beſt, that you do not (ſince you need not) engage yourſelf expreſsly againſt the interpretation of *Socinus*. And your margin may add, that however the interpretation of *Socinus* may ſeem ſpecious and coherent to his principles, yet the other ſenſe is more catholickly received, and very proper for the apoſtolical inference, that the *Gentiles* might ſee ſo much of God in the large volumes of Creation and Frame of the World, as might oblige them to more unblameable converſation; and the ſin of idolatry there reprehended, verſe 23, as the leading tranſgreſſion, was not peculiar to that age, but was the ſin of the old world. And it is not contrary to the remarks of *Socinus*, that the ſame ſcriptures ſhould ſometimes have a depth and latitude comprehenſively reflecting both upon the creation and the goſpel.

SIR, I muſt not trouble you with all the reaſons of theſe overtures, but I find it ſafer (and fitter for the diſpatch of theſe Eſſays) to call for experimental theology, than to engage in any heats againſt *Socinus*. For, though he never had the credit to raiſe a national church, as *Luther* and *Calvin* have done, yet all parties (as well Romaniſts as our Engliſh hierarchy, or others, the deepeſt of them) do all confeſs him to be the acuteſt, the ſmootheſt, and yet the moſt dangerous of their adverſaries: and as a mere virtuoſo he hath raiſed in all ingenuous perſons, that read him, a greater admiration, than either of thoſe leaders, or than *Eraſmus*, who was indeed greater than both. And *H. Grotius* and other his ſtrongeſt adverſaries have ſo often rendered up their cudgels to him, that we may fear his growth to a great name in the next age, and eſpecially by the weakneſs of moſt of his adverſaties, who do commonly undertake him before they have wit enough to underſtand him. The Romaniſts do think, that all other their adverſaries are at their retreat, and fading flowers, as *Balzac* called them. And we all confeſs, that no man ever diſputed better againſt Jews, Mahometans, and Romaniſts, nor better defended the authority of ſcriptures. And though he challengeth all mortals at the ſingle rapier of holy ſcriptures, yet no man enters the liſts againſt him, but with ſome advantage of cloak and rapier, fire and thunder on his ſide. And I fear he makes too full proof by viſible examples, that our native metaphyſicks will not convince all human nature of the Godhead (for all are not ſo deeply reaſonable) without the help of divine revelation, or ſome parental tradition, which hath a reverend and obliging force, or right to awaken all human regards. But I doubt alſo, that his mind is not in this argument fully opened by himſelf, or underſtood by others: for ſuch as write his life do deplore the loſs of his plea againſt atheiſts, which was by himſelf eſteemed the moſt elaborate of his works, and his maſter piece. There we might have ſeen what he eſteemed the fitteſt arguments againſt ſuch as had no belief of any revelation, as divinely authentical.

SIR, In this I commend your prudence, that you keep the garb that is proper for a perſon of honour, and leave us choleric men of the lower region to anſwer to challenges, and to fight in duels. And by this emptineſs you will ſee, that if I could have darted any objections againſt you, I ſhould not have ſpared you. And this I dare doom, that whoever proſecutes this taſk, gets no more credit by it than *Milton* got by his Iconoclaſtes. And therefore this is all you muſt expect from me for animadverſions. Of wild notes and promiſcuous experiments, I am like to ſend you a great deal more than enough, of which the firſt exemplar may be medical, the reſt more extravagant, at random over the whole maſs of the creation.

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

Honourable

Yeovell, Nov. 2, 1663.

Honourable Sir,

I SEEM for a while to owe you a trouble once a fortnight, of which kind the annexed is a parcel.

BUT you may juſtly aſk me, what I mean by this? and whether any thing can be more trivial, or more vulgar than this? or whether any phyſician, or ſurgeon, cannot diſcover much better, and nobler things than theſe?

To all which I anſwer, that when I have explained my aim, I ſhall not be aſhamed to ſay, that the more vulgar the things are, the better and more uſeful they may be to the generality of people: and the vulgarity of theſe generalities, do not exclude, but introduce the more received experiments of profeſſed ſurgeons and phyſicians: and, above all things, I would decline the affectation of telling wonders and rarities; for it is a temptation to ſtep beyond the juſt proportion of truth, and can ſignify no more than *penes authore fit fides*. To diſcover the bottom of my thoughts, I muſt recollect to your memory, the Beverovician induſtry, which compiled a volume of letters or addreſſes from the learned of thoſe days, to determine this queſtion, whether medical art, or other care, could add to the length of a man's days; which related then chiefly to the hot queſtions then on foot concerning predeſtination. All this volume brought forth nothing but daſhes of great wits. But, honourable Sir, if you, or any other perſon by your appointment, would engage and receive the addreſſes of honeſt and intelligent perſons, in the way of their experiments, ſelecting and expunging, as you ſaw needful, to avoid impertinencies and repetitions; (to which freedom, I would not only allow from my heart, but entreat your ſponge) this might ſoon ariſe to a far more profitable diſcourſe, than the cavils about predeſtination; though that be called theology, this a mere regimen of health.

SIR, I owe you another kind of thanks, for the ſleep medicine; but firſt I would be diſcharged of this poor mite, of which kind I ſent you two ſheets a fortnight ago, herewith two more ſheets, and I think one ſheet more will exhauſt my ſmall ſtock of vulgarities. And theſe bearing the title of experiments, muſt bear ſome ſhape of his addreſs, who engageth his fidelity. The meſſenger makes me abrupt, but always,

Honourable Sir,

your moſt faithful ſervant,

J. BEALE.

Experiments moſt part medical, or chirurgical.

1. ABOUT thirty years ago, *Thomas Day* (an honeſt apothecary of *Cambridge*) aſſured me, that a patient then came to Mr. *Eade*, practitioner then in phyſick there, and told him, that his blood was white. To try the truth, Mr. *Eade*, or *Thomas Day*, opened a vein in his arm, and the blood, as it ran from the vein, had a pallid reddiſhneſs; but on the floor, and in the diſh, was as white as milk. Mr. *Ead* gueſſed, by that, and other circumſtances, that if he had not then uſed remedies, he had proved a leper.

2. SIR *R. P.* was there my pupil, and had moſt horrid fits of hypochondriacal, and almoſt epileptical paſſions, holding him many hours together; his ſenſes alienated, his mouth ſpeechleſs, and a ſtrange murmur in his bowels, which ſome thought to ſignify obſeſſion. Mr. *Eade* propoſed a cupping-glaſs, and ſcarification, on the hindpart, or over it, of the outſide of his thigh. Dr. *Gliſſon*, and all other phyſicians, deſpiſed, and, indeed, derided that propoſal. I ſpent a good ſtock of money in the way of Dr. *Gliſſon*, and others, with no viſible benefit; for the fits encreaſed in violence and durance: at laſt, in a fit, I tried the cupping-glaſs, and found the benefit immediately, and, by taking off the glaſs, the raging fit returned. After ſome proofs in this kind, the place was ſcarified, and a drawing plaiſter applied. And thus, by carrying a glaſs in my pocket, to apply it as oft as the fit took him, the malady was in few weeks cured.

3. MR. *Thomas Mountague*, (now ſchoolmaſter of *Eton*) when about twenty-one or twenty-two years old, being then ſtudious, (yet of a very active body, and very ſober, and almoſt beyond example of ſpare diet) was taken with an extreme gout in his great toe. Dr. *Nic*, of *Cambridge*, directed, he ſhould open a vein in his toe, by which he was cured totally, as he told me ten years after. Quere.

4. WHEN I was a child, I ſtead frogs in ſport, to ſee what ſhift they would make when ſtead. By miſtake, as I practiſed on a toad, I found his throat ſwelled, and the duſky ſpots; and thereupon did caſt him out of my hands: I was not bitten, but ſoon after both my hands and handwriſts were covered with a ſcab; I could not then gueſs what elſe might be the cauſe: I was cured by contuſed plantain leaves, or the oil of it.

5. (AT *Eton* I threw many frogs into the *Thames*, to ſee how far they could ſwim. Some did reach to cloate-leaves there growing upon the ſhallow water, and were there ſaved; others were drowned, as we could well obſerve. Yet I have ſeen other frogs, in other places, live under water, and engender there ſo, as to ſtick together faſtened, as dogs when lined to bitches, ſo as not ſuddenly to part at a blow with a ſtaff.)

6. ABOUT the beginning of theſe civil wars, I was overwhelmed in melancholy and grief, to ſee the publick confuſions and ruins, (my neareſt alliances, and deareſt friends, being engaged, and many loſt on both ſides.) This broke out into the blind piles, ſtoppage of my ſtomach, hypochondriacal torments, jaundices: but nothing did more moleſt me, than

than a tetter, which did ſeize on the back of my hand, ſometimes both hands, ſometimes both handwriſts; alſo far upon my arms, and ſeeming to have devoured the epidermis. I ſubmitted punctually to the advice of many intimate and friendly doctors, for inward and outward applications. I changed air and diet, from *Herefordſhire* (my native country) to *Shropſhire*, and back again to *Herefordſhire*. Notwithſtanding all cleanſings and care, the tetter reproached me and my phyſicians, more than ſeven years. In all which time, this ugly tetter was a dial to tell me what food, drink, air, diet or exerciſe, was more kind than other to me; and what medicine, inward or outward, had moſt effect: of which I will here give a brief account of three.

A GOOD gentlewoman promiſed me all things from the oil of wheat. Thus it was drawn. The blackſmith heats his anvil red hot, drops the wheat on, which burns to coal, and the moiſture wiped off is the oil as black as ink. At firſt touch of this oil, I found it burn like a fire coal; but I would be *Scævola*, and laid it all over the back of my right hand; and immediately my torments were as great as thoſe of *Scævola*. It did put me in mind to ſuſpect the liquor of wheat to be more outragious, than that of Jucca, yet Mars might have a ſtroke in the injury. The ſwelling haſtned up my arm, and ſhoulder, the kernels under my arm pits, and my breaſt became very ſore, ſwelled, and inflamed, till it grew to an outragious fever. A ſkilful doctor came ſpeedily, and opened a vein, and by other lenitives, under God, cured me. At the beginning of a tetter this oil may be applied, and will burn out the tetter, and leave a firemark behind. But when the tetter is ſpread, and the humour reſorts, and abounds, and the epidermicks deeply pierced, this medicine is too violent.

8. To omit my trial of pigeon-dung, verjuice, vitriols, mercuries, and thouſands of others. My ſecond remark is, of a healing ſpring, very famous for curing many frets, ulcers, impoſtumes, and had lately done a greater cure upon a poor man's rotted legs, than our phyſicians or ſurgeons could do. This water I tried often, and by warming it in my mouth (by which in the morning it was mingled with faſting ſpittle) I did let it fall warm upon the tetter. It would in a moment viſibly cloſe up the raw fleſh, gathering a thin ſkin over it, as ſpeedily as milk gathers a ſkin upon the fire. And as the ſkin did ſpread all over the tetter, a moiſture would aſcend in round drops through large pores, which being wiped off, and more water poured on, at the ſecond or third time, the pores were alſo healed up. And this courſe I took as often as I went to other tables, to hide the ulcer from giving offence. But this was falſe daubery, and within a day or two I was conſtrained to make ſatisfaction.

9. THIS ſeemed to note, that the cure muſt begin within doors; and ſome from great experience extolled betony, ſome fumiterry, for the purgers of blood or brain from melancholy, ſome elder, as the beſt calmer of hot inflammations, and angry humours. I tried all, and with long conſtancy, but without ſucceſs. What cured me, I cannot confidently affirm; but an intelligent gentleman did ſo highly extol ſanicle, with ſo many proofs of his own, and other mens experience, that by the infuſion of it in drink, it would heal all ulcers within and without, that I uſed it, and found the tetter much abated; and caſually reading *in horto ſanitatis*, that the gum of plumtree, diſſolved in vinegar, would heal tetters, I tried it, and found this benefit, that it would cover the ſore, as with a glaſs, ſo that I could wear a glove. Soon after it came alſo in my mind to drain out the moiſture with vine-leaves, a day or two, and then to apply the gum, and with the uſe of infaced ſanicle in the ſame time I was cured. Upon abuſe of diet I have had ſome red ſpots, giving me, many times ſince, warning to be careful. And in want of vine-leaves I had (but with ſome inflammation) a like benefit from raiſins cut and ſpread over the ſore.

10. BUT every year or ſecond year ſince, I am in ſummer viſited with ſome hot inflammation, which begins in one or both my legs, about the ſmall. And water-gruel, in which the buds, inward rind, or ſome part of elder, is decocted, is my beſt remedy.

11. IN theſe and other maladies I have tried the operations of many vegetables in pottages, and in drink, which being a little warmed would draw forth the ſpirits of the vegetables. But for cordials can prefer no leaf before balm (which is alſo highly recommended by doctor *Smith* of *Shrewſbury*) nor any bloſſom before gilliflowers and cowſlips. And for lenitives, and longevity, I prefer elder. I wiſh ſome trial were made in a cup of balm-ale, how agreeable it would be to the perſon who finds an offence at honey. Becauſe balm hath been always eſteemed the chief of honey-flowers, beſt beloved and moſt friendly to bees.

12. DR. *Sheafe* (now arch-deacon of *Wells*) had a wound in his heel, by an arrow. For which (being my chamber-fellow at *Eton*) he ſuffered (and I in my heart) all the horrors of ſurgery, for more than a year. At laſt there was no hope but his leg muſt be cut off. A good woman of *Windſor* deſired leave to make one trial of her ſalve. This ſalve ſo fermented the wound, that it wrought out ſome yarn of the ſtocking, which the forked arrow carried thither. And ſoon after all was healed. I ſaw the fleſh ſo often eaten away, to no other purpoſe but to ſearch the bottom, and to his horrid torture, that it gave me a better eſteem of a good ſalve, than of a famous ſurgeon; for he had the advice and handling of the beſt ſurgeons that were then of note.

13. THAT the fleſh of ſome perſons is much more apt to heal, than of others, I well know. And do thence alſo conceive, that inward applications may conduce far towards the healing of an outward wound. As burſtneſs or rupture is healed by the powder

of conſounds, and diſlocations in the head and bones by oſteocolla.

14. WHEN I was a child, I noted, that the clawings and deep bitings of a parrot (which did it in love and fondneſs) were ſuddenly healed, truly to my great wonder; but a ferret, in a high rage, and ſwelling about the head, like a ſerpent, bit the very end of my finger, which preſently wrought upon my body, as if it had been the biting of a ſerpent; which begat in me a ſore wound, and long ſickneſs.

15. IN turning the key, the middle joint of my middle finger raſed on a nail in the lock. It did ſcarce bleed, and was of no depth, yet it ſwelled up my arm, till it laid me in a violent burning fever above a fortnight. Whether the ruſt of the nail, or the ill temper of my body, was more obnoxious, I cannot ſay. But a ſmall ſpark may fire a tinder-box.

19. A LADY of my acquaintance did frequently cure her great pains of her teeth by tying a leaf of water-pepper, or arſe-ſmart, about her little finger, till it raiſed a bliſter there; which ſhe healed with a leaf of wood-bind; if that were not to be had, ale-hoof, or other good medicine for burning, healed it. The leaf ſhould be tied between the firſt and ſecond joint of the finger.

17. WHEN a ſharp defluxion hath endangered the ſight of the eye, I have ſeen it oftentimes ſuddenly diverted by raiſing a bliſter in the pit of the neck behind, and drawing off the moiſture that way.

18. A VINE-LEAF, or a leaf of a tender young colewort have (both of them) a ſtrong faculty of drawing; and I have ſeen many great cures of divers kinds done by their ſeaſonable applications.

19. OFT-TIMES, when I have felt my vitals in danger of ſome great diſeaſe breeding within me, I have rubbed off the ſkin on the back of my hands, hand-wriſts, or ſmall of my legs, I have diſcuſſed or drawn off the more horrid malady, freed my ſpirits, and then, after I have drawn off ſome tart moiſture, I have ſafely healed the raſed and fretted part again.

20. A GENTLEWOMAN (a near friend of mine) had a very great and dangerous wen on the ſide of her neck, which with haſty growth deformed her, and diſcouraged her phyſicians and ſurgeons, who applied for many months divers medicines of beſt account. I ſent to Mr. *Hartlib* for advice, and my good friend Dr. *F. Cl.* directed, that ſhe ſhould, for ſome time, hold and preſs hard on the wen the hand of a dead man, who died ſome violent death. She obſerved it punctually, and ſhe ſaid, the coldneſs of the hand cooled her heart, and the wen preſently withered, and ſhrunk ſo ſmall, that it is not viſible, nor much bigger than a nut kernel.

21. WILLIAM earl of *Northampton*, grandfather to this preſent earl, chid his cook for his ſcabby hands, as he called it; for his hands were all covered with warts, very great and ugly. The cook anſwered, that he could get nothing, that would drive away his warts. The earl bade him rub them with a dead man's hand, and he would warrant the cure. Soon after the earl died ſuddenly. And then the cook, remembering his lord's words, whilſt he watched the corps, ſtroked all his warts with the dead hand, and ſoon found his lord's warrant and word to be very good. This I received from my brother *T. B.* who was perſonally privy to the truth in all points.

22. WE find and feel, that colds, coughs, rheums, fevers, colicks, palſies, and other dangerous and mortal diſeaſes, are begotten by the violence of damps, winds, or other contuſing operations entering at the hand-wriſts, pit of the neck, codpiece, ſoles of the feet, head, *&c.* And theſe diſeaſes are ſometimes drawn off by fomentations and applications to theſe parts.

23. MR. *Harriſon* (the ſchool-maſter of *Eton*) told me, that when the great plague was in *London*, in a tavern he fell down mortally ſick, and thinking it was the plague, he took as much as a walnut of Venice-treacle, and ſweating on it, recovered. A fortnight or month after, he returns to the ſame tavern; the people all wonder to ſee him alive, and tell him, that when he fell ill, there was one in the houſe dead of the plague, which fell ill in the ſame manner as he did: This was no good news to Mr. *Harriſon*; and before he parted, he fell again, as formerly; and, uſing the treacle, recovered again; but within a month fell into a violent and long laſting fever, which (as his phyſicians told him) he might have prevented, if, after the former fits, he had breathed a vein and purged.

24. DR. *Wedderburne* gave me this medical counſel (as we returned together into *England*) that I ſhould not be ſick before I was ſick, noting the puling ſpirits of ſome, and generally of ſcholars, who do always fancy themſelves to be ſick, or ſickly, and by fancy and frequent medicines do make themſelves ſick indeed. And I was not much guilty of it. For I never took vomit yet, nor ever took a purge, or opened a vein, till I fell into a burning fever in *Orleans*, by advice of Dr. *Du Cheſne*, being then thirty three years old. But Sir *H. Wotton* ſaid, it was proverbially noted to be the Engliſhman's folly, that he is the laſt, that betakes to his couch, and the firſt, that riſeth up. And our covetous clowns do commonly caſt their lives away, to ſave charges: they will not be perſuaded to ſend for the phyſician, till it be too late. Yet we commonly find, that after the third or fourth day's rage of ſickneſs, the phyſician is put to an after-game, and ſeldom recovers ground by his ſlow methods and Galenick or more preſumptuous compoſitions.

25. As ſome fleſh is more apt to heal than other, ſo are ſome bodies more pliant or more compliable to medicine. And though I cannot commend judge *Rumſey*'s Provang for any but drunkards, gluttons, and ſuch monſters; yet if one ſhould ſurcharge or offend his ſtomach (which no virtuous perſon will often do) it is a felicity, and a kind of exerciſe of

the body, to have a facility in diſcharging the ſtomach by vomit, which may provoke worſe diſeaſes. And the like of purgation by ſtool, urine, ſweat, perſpiration, exerciſe, *&c.*

26. AFTER long faſting, a moderate proportion of food hath ſurcharged my ſtomach, more than twice as much at an ordinary meal, and ſo is wine or ſtrong drink very heady in a faſting ſtomach, or great thirſt.

27. WHEN phyſicians tell me, I muſt open a vein, or enter into a courſe of phyſick, then I fall to elder pottage in the morning, and a ſpare diet, and find this my ſureſt phyſick.

28. FROM my childhood I have a corn on the inſide of my little toe, which torments me and cripples me more than ſome are tormented with their gout. It is ſoft, and hath a black eye, and the touch of the ſhoe or of any artiſt's hand, that cuts it, yea, the unavoidable compreſſion of the next toe, gives me a deeper torment than any other inciſion. In all ſharp weather of heats, froſts or long rain, it is my almanack. I tried ſo many remedies, that I loſt all hope and belief, and feared ſome cancer or gangreen from it. About fifteen months ago, I bound to it a leaf of elder morning and evening for a month. This hath altered the nature of it, and reſtored me to my feet and legs better than ever I had from my childhood, notwithſtanding that the black eye remains, and muſt be cut ſometimes, *&c. &c.*

Experiments medicinal, chirurgical, &c. *Nov.* 2, 1663.

ABOUT twenty ſeven years ago a gentleman of quality, in the prime and beauty of his youth, had a moſt afflicting ulcer on the back, and all about his hand, which for many years was obſtinate againſt all applications and medicines, and diſgraced him in all companies, (he being then in good luſtre amongſt the gentry and in the Engliſh court) and it was thought to be a tetter: as I ſat with him in private conference, he fell to his uſual rubbing; and the rage of the ulcer conſtrained him to break up the ſkin with his teeth in the very middle of his palm; and then examining the orifice, he told me, he diſcovered a bright jewel there. We examined it, and found it a cryſtal as big as the nail of a man's hand; which being taken out, he was ſoon healed, and then could remember how he broke a Venice glaſs with his hand on a table, ſo long ago as his hand had been maimed; but it was a far diſtant part of his hand, that ſtruck the glaſs, but a piece being ſunk through the epidermis might eaſily, by the motion of joints and ſinews, remove the place. And he, that notes the anatomical mechanics of the hand, will diſcern what miſchief a jewel would do in that place. Mr. *Butler* of *Cambridge* got much credit by his witty ſearch into ſuch circumſtantial accidents; and I have oft-times ſeen a chirurgeon do more good with his wit and hand, than with his plaiſter. And he, that hath read *Vocerus de Lamiis & de præſtigiis*, will find ſtrange removals within the epidermis.

A CHIRURGEON of my acquaintance finding himſelf at loſs about the cure of an ulcer near the knee, by diligent ſearch found a ſmall pin there. Another time being in the ſame caſe about an impoſtume under the ſhort ribs, by a bold ſearch found a pin there alſo. They conceived the pin to come thither through the ſtomach, being ſwallowed by chance.

SIR *R. P.* falling down a narrow ſtairs bruiſed his back and breaſt, and immediately ſwelled inwardly, that his breath was ſtopped. I cauſed a vein in his arm to be opened, and preſently he recovered breath, and was afterwards cured by fit medicines. The help of phlebotomy in falls, bruiſes, and contuſions, and in deep percuſſions of the air, which beget violent fevers, pleuriſies, *&c.* is well known, but not ſo commonly or vulgarly publiſhed, but that I have known many lives loſt by the ignorance or wilful neglect of it; and as many lives loſt by unſeaſonable phlebotomy. But theſe extremities deſerve a publick advertiſement.

I RODE in the company of a fat big man, that was very drunk. On a ſudden he fell from his horſe flat on his back a heavy fall, and immediately expired. I leaped off my horſe, and more by art than by ſtrength I drew up the forepart of his body, head, and ſtomach, to lean forwards on my body. After a long pauſe as I ſhook him upon my back, I felt him begin to draw breath, which he drew with a very long ſtroke, and loud noiſe through his noſtrils, as ſome do ſnore in their ſleep. With long patience I brought him home to his own houſe alive, leaving mine own road and buſineſs. I could not perſuade him to the opening of a vein, (ſome country people are very averſe to it) but by wrapping him in a warm ſheep ſkin, taken ſpeedily from a live ſheep, he recovered in few days. I have oft-times noted, that if a perſon falls on his head when he is drunk, he is much more apt to expire, loſeth his ſenſes, and dies away as ſome do in their vomit, if not carefully attended.

AN old man cut a deep clift in his foot between his inſtep and his toes, by the glance of his ax, and lay expiring by the waſte of his blood. As ſoon as I ſaw his caſe, I caught up his foot, and joining both ſides of the wound together with my hands, I ſo held it, till the blood turned, and ſtayed, and the wound was in time healed. Some lives I have ſaved by cloſing the orifice or covering it, after I had read it in my lord of St. *Alban's*. And ſome lives I came too late to ſave, which were loſt by the want of this advertiſement.

A REAPER in this neighbourhood ſtruck his reap-hook in that part of his leg, which is here called the pope's eye. No man could deviſe how to ſtop the effuſion of blood: a chirurgeon dips lint in vitriol, and ſo ſtops it ſuddenly, but the wound feſters, and the man dies ſoon after.

ABOUT three years before Sir *H. Wotton* died, there aſcended into his noſtrils ſome hypochrondriacal

pochrondriacal vapours, which he and his phyſicians conceived to ariſe from his ſpleen, and much care they had to cure his ſpleen; but the vapours were in his own noſe ſo offenſive, that he thought them much worſe and more odious than any carrion, and that they gave the like offence to all others; for which cauſe for ſome weeks he admitted no perſon but *Nic Oudart* and *Will. Knat* to come into the room. After he was ſatisfied of his miſtake, and that no offenſive ſmell came from him, he went all abroad for advice and cure. Then I heard the judgments of all famous phyſicians concerning ſpleen, melancholy, *&c.* and had the firſt notice, how the ſcorbutick had a large yet ſecret dominion, and ſent more to the grave than all other maladies; and ever ſince it hath ſo appeared by my computation, and now it is my own lot.

MY lady *Philips* tells me (oft-times repeating it) that when her huſband Sir *Robert Philips* was ſent to the *Tower*, the ſcorbute took away all her teeth (this was about forty years ago) yet ſhe ſtill ſurvives (in the conflict with that diſeaſe) in a healthy condition, with roſy cheeks, having been for many years only a water-drinker, and driven thereto to allay the heat, which then boiled in her ſtomach. If water gives health and longevity, why do we take ſo much pains, and ſend ſo far for ſo many ſorts of drinks?

I CONFESS, that the ſcorbute did juſtly puniſh me for defaults in the beſt philoſophy. My inward diſcomforts begot the diſeaſe. But why ſhould a man yield to any ſuch diſcomforts, as long as he can keep faith alive, and hope of a receptacle in heaven? If the heart were cheerful and fixed on God's goodneſs and mercy, the ſimple diet of the long living age (water and wholeſom grain) would be our beſt medicines and preſervatives, and this may raiſe a reſolution rather to embrace poverty, than to fear it.

I FED ſome years at the beſt ſauced table (as fame ſpoke it) in *England*, and made a ſudden change to a collegiate diet; and ſuch like alteration I have more than thrice made, not by fits, but by habitude for ſome years in either kind, yet with no alteration of my health, but rather for the better at the jejune diet; and for five years, or thereabout, I drank mere wine or mingled with water, the reſt of my life I drank a middle ſort of beer. But what is this, if compared with their change of diet, who travel in long voyages by ſea, or adventure upon new plantations unprovided of their uſual diet and lodgings? Such is the extenſiveneſs of human capacity for the ſhort tenure of our days, to the meaſure, which hath been common theſe four thouſand years, or near it. It is but a virtue of forty hours patience, to reduce the moſt luxurious palate to be ſatisfied and delighted in the coarſeſt rural fare; and that begets the firmeſt ſtrength, and moſt conſtant health. But to paſs from one extremity to the other by gentle degrees, is the ſafeſt motion; and a rural employment fits the ſtomach for rural fare. And then a man taſtes the truth and ſweetneſs of *Horace* in his Epodon:

Beatus ille
——Dapes inemptas apparet.

IN my childhood I had the meaſles, which (as I did then and do now gueſs) I caught, as I paſſed through a gatehouſe, where in an inward chamber a ſervant lay ſick of the meaſles. For I ſeemed to ſmell a noiſom ſmell, as if it had been from a boar's-ſtye (for that ſmell continued in my noſtrils for a week together, and ſo long it was before the ſymptoms appeared) loathing all food, and offended at my own breath. I was then much addicted to running, leaping, and ſuch athletic exerciſes. The only medicine in thoſe days for that diſeaſe, and for the ſmall pox in all thoſe countries, was a ſmall handful of the reddle, with which here they reddle ſheep, drank up in our ordinary beer. I tried it both for meaſles and ſmall pox, and ſaw it uſed by many others, of which not one miſcarried; which makes me ſay, that either the ſmall pox of latter ages is more malignant, or the medicines more dangerous.

THE meaſles I had in a country village, and the next ſummer, in *Worceſterſhire*. I caught the ſmall-pox, and I thought, I ſmelt the ſame offenſive ſmell as before in an apothecary's ſhop; and, returning to the ſhop to enquire the matter, I was there informed, that a woman came then into the ſhop, who attended one, that was ſick of the ſmall-pox. If I had not my wound before, this anſwer might help fancy to beget it. As ſoon as we ſuſpect the infection, we drink of this reddle in a draught of beer, faſting before and after. My brain was diſtempered; for a day or two I thought myſelf all the while toſſed in the air by the clouds, which were as winnowing ſheets, forcing me above ground, as chaff flies by the wind, and I uttered grave lectures of morality, being then about twelve years old. After two days, I could riſe out of my bed, and, by fooliſh guides, was immediately put on horſeback, and carried about twenty miles, the red puſtles riſing all the way as I rode, and a very giddy and weary journey I found it. Great care was taken, that I did not increaſe heat, nor take cold after I alighted from my horſe. And that I conceive, ſhould be the chief care, and, perchance, all the medicine in thoſe diſeaſes, in which the blood is in a tumult. And this reddle I ſhould not deſpiſe in peſtilential infections, at leaſt to cleanſe the body of man, as it cleanſeth ſwine. And this I join to honourable Mr. *Boyle*'s Obſervations, Uſefulneſs of Experiments, part 2. c. 3. pag. 132.

COUNTRY folk have many ſluttiſh medicines, which ſerve their turn, and ſavour to them better than the apothecary's ſhop. For a bruiſe, ach, tumour, impoſthume, or cancered breaſts, cow's dung, beſt when the cows feed in their kindeſt paſtures, and taken hot as it comes from the body of a cow, and fryed with bear greaſe: for a ſtitch in the ſide,

as they call a pleuriſy, the juice of horſe-dung, as that comes hot from the body of a horſe, preſſed and drunk in their ordinary beer; that of a ſtone-horſe, feeding high upon provender, being preferred. Pigs-dung, or rather boar's-dung, to ſtop the blood at the noſe. For ſore eyes, the white of hen-dung; for ſore throats, album græcum, *&c.* *&c.* their own urine, *&c.*

WHEN the peſtilence raged in *London*, (about thirty-five years ago) I was amongſt them for ſome weeks, and took much care to prevent, that I might not ſmell that boariſh ſmell, which ſeemed ſo nauſeous, when I took the infection of the meaſles and ſmall-pox; to which purpoſe, I did contuſe rue in my noſtrils, and eat rue and ſage dipped in vinegar, with a morſel of bread and butter in the morning.

WHEN I am afflicted with deep ſorrow, or have eaten freely of pork, or any hog's fleſh, the foreſaid unpleaſant vapour returns into my noſtrils, or my left noſtril is ſo ſtopped by the thickneſs of the vapour, that I cannot breathe through it but with difficulty.

I WAS about fifty years old, before I made trial, or much believed the great power of elixirs, Paracelſian laudanum, or other richeſt medicaments. Now I have tried ſeveral of them, both upon myſelf, and upon many others; and will give a brief account in one or two examples.

MR. *H.* at ſeveral times ſent me three ſmall vials of elixir proprietatis Helmont. the laſt vial far more excellent than the two former; two or three drops of the laſt was more effectual than thrice as much of the other: to myſelf it was cordial, chearing, and reſtorative. I never failed to recover immediately from fits of the mother, hypochondriacal and convulſive fits. An old woman walking abroad early in the morning was ſmitten, as they call it, *è cælo tacta*; there was no viſible blaſt upon any part of her body, but down ſhe fell, and the pangs of death were upon her, her pulſes ceaſing, and her breath almoſt ſtopped. In a ſpoonful of ſack, I forced down a few drops, and, in the time of a ſhort prayer, ſhe recovered, called for her clothes, and ſhe ſeemed to give us the guiſe of the reſurrection.

ANOTHER woman (aged above eighty) had kept her bed (unable to ſit up) a week, and lay hopeleſs. When I entered her chamber, thoſe that attended her ſaid, that her feet, legs, and thighs, were dead already ſome hours ago, and her breath departing; but almoſt as ſoon as ſhe received the doſe of elixir, ſhe ſpake with a ſtrong voice, and cheerfully; and, within an hour or two, called for her clothes, roſe up, and recovered, and lived about two years after.

AN apothecary's wife of this town, by many diſcontentments, fell into ſwooning and hyſterical fits. The apothecary exerted all his Galenical art in vain for ſome weeks. With one doſe of this elixir, ſhe recovered for a month, and, after a relapſe, was recovered with one more doſe, and ſo hath continued theſe two years.

THE laudanum, which I uſed, was Helmontian, and drawn, as I gueſs, by the ſame hand, which drew the elixir, Dr. *C.* To ſtop violent defluxions, and to appeaſe tumultuous ſpirits, and to give ſleep, two or three drops of it in beer have raiſed more of my wonder than the elixir did: and I have ſpent three or four vials, never failing of my expectation, but indeed ſurpriſed with the iſſue far beyond my expectation.

I HAVE tried a few ounces of ſpiritus cornu cervi, and found it a rare reſtorative.

BUT lately taking each morning three or four drops of eſſence of balſam in a ſpoonful of ſack, I find it very effectual to ſtop or eaſe a conſumptive cough, and to ſtrengthen nature.

ABOUT eight weeks ago, I had a virulent ulcer in the overpart of my noſtril, under the corner of my left eye; it had there continued above a month, increaſing the pain: going to bed, I took a pill of eight or nine grains of *Richard Matthews*, who juſtly and honeſtly (as his unelegant book ſhews) calls himſelf the unlearned alchymiſt: within an hour I found it work ſtrongly upon my noſtril, opening that paſſage, which is wont to be ſtopped by melancholy vapours, and diſtending it wider than ever I felt it before, and the griſsles ſeemed to make a creaking noiſe all the while: my ſtomach had a deep pain, and, I conceive, the doſe was too much by two or three grains; ſome gentle ſweat I had, and a kind ſtool on the morrow morning: and that very day the ulcer in my noſtril was healed.

BUT another ulcer of the like malignant kind was in the ſame noſtril near the end of my noſe; this was not healed: I took another pill of the ſame weight, and with like operation the ulcer abated, but was not quite cured. I took a third pill, and it was throughly cured. Now I ſeem to diſcern, that theſe ulcers proceeded from a ſcorbutical malignity: and ſurely this unlearned man hath found a medicine, that doth aſſiſt nature almoſt univerſally againſt any malady, and very proper, when the diſeaſe is radicate, or complicate with ſeveral diſaffections, that cannot bear a known name, or is of one kind, or of one nature.

I SAW a child of ſix years old ſo ſwelled about her head and face, that ſhe had no reſemblance of the countenance, which ſhe had two hours before: my mother gueſſed what the matter might be, and forced her to vomit, and with it there came up a ſpider, ſo contuſed and broken, that we ſaw little more than the legs. After vomiting, the child took ſalad oil, and was ſuddenly well again.

I HAVE often debated why ſome medicines might not operate as ſtrongly and ſpeedily for health, as ſome poiſons do for death and deſtruction; and, in my ſmall experience, the chymiſt alone ſeems able to manage the queſtion, and by their aid I have ſeen ſuch ſudden and unexpected recoveries, as may be compared with the diſpatch of ſtrong poiſon.

JOHN CARY, a ſurgeon of this town, had mingled in one vial, for his chirurgical uſe, about four drams of ſublimate, with alum and lime; a woman drank it up, and was very ſick and ſwelled (or ſhe fancied ſo) immediately. This noble earl of Marlborough came by chance thither, and finding her caſe, poured his box of tobacco into a porringer of water, ſtirred it, and ſtrained it as ſoon as the water was lukewarm; ſhe drank it, and vomited, and was well.

Yeovill, Nov. 9, 1663.

Honourable SIR,

YOU cannot bear words, but require deeds. *Nefas verba tibi dare, rem præſtare oportet.* But what offering ſhall I bring? My poor ſtorehouſe hath nothing worthy of your altar; yet they were accepted, who brought goats hairs and badgers ſkins for the tabernacle. This is my caſe. About fifteen years of theſe late bad times I have been a poor farmer. And my hereditary intereſt was upon the mountains of *Seir*, amongſt Edomites (Old Britains and Kymbrians.) Here, as concerned, I converſed with *Cato*, *Varro*, *Columella*, *Palladius*, *Creſcentius*, *Collet*, *Paliſius*, and ſuch as I could get of French, Spaniſh, and Italian ruſticks, *Googes*, *Hereſbachius*, *Marlbanryning*, *Tuſſer*, Sir *H. Plat*, and *G. Plats*; and as far as Mr. *Hartlib*'s correſpondence would help my information. I tried all things, new and old, by the event, what might be done for improvement of Engliſh paſture, by Engliſh or foreign ſeed, or art, water, or aſhes, clover, ſaint foin. I tried the ways of finding ſprings, and conducting them; of healing bogs, or dragging uliginous land; I tried divers ſorts of grain; I examined the uſe of marl; how far and by what ways earth or ſoil might be altered or improved; divers compoſts; how vegetables and animals might be improved or employed for human uſe; how the wildeſt may be trained to be moſt accommodable. I enquired how far aſſes and mules might be fit for *England*, *Scotland*, *&c. &c.*

AND hence I here ſend you a wild ſheet of ſheep and goats, where you will read, that, in old account, ſheep were the ſoundeſt of cattle, goats never ſound; and if we regard the old rules (of which you find ſalt in uſe for ſheep) our flocks will be ſafe, and our herds of goats a peculiar riches in the land of miſery and barrenneſs. Of bogs, ſprings, marl, paſture, *&c.* I intend in order.

BUT what help from theſe ruſtical affairs for man's dominions? Very little I confeſs from my hand in this rude way. For I have no leiſure to poliſh, or to finiſh: but if I had a reſidence in *Greſham*, I ſhould rejoice to be a collector and compiler of others fuller informations. Now I can only adviſe, that you caſt a ſlight glance upon theſe, to taſte whether any line may be fit for your palate (for that is the beſt preferment it can have) and then ſpeedily to rid your mind of it, by putting it into the hands of ſome perſon, who undertakes theſe agreſtic affairs. Yet, if I did affect high language, and to make great promiſes, I would tell you, that by theſe clowniſh advertiſements, we can give man dominion over the winds, air, water, and lands. We can raiſe cool winds, in the extremeſt ſummer heats; and conduct them for the beſt of human uſes. We can diſſolve the frozen winds of rigorous winter. At no charge, we can ſearch the bowels of the earth, and by our ſprings diſcover all her treaſures, mineral, metalline, coal, *&c.* more by one man's art and experience, than by the labour of thouſands of pioneers, with ſpades or pickaxes, *&c. &c.*

AND let me ſay to you, that if you give theſe things in charge amongſt your acquaintance, that each man in his way may add to the ſearch of others, then you do fully proſecute the Verulamian deſign; then our labour is joined and collegiate, and not always running in the narrowneſs of ſingle endeavours. And what had *Cæſar*, *Alexander*, or *Solomon* done, the firſt in war, or the laſt in peace, if they had not employed more hands than their own?

SIR, eaſe your own hands the more, that you may the better overſee the main work. And for us, that are in ſtreſs of buſineſs and diſtance, it is well, if we be hewers of wood and drawers of water.

I PRAY, that mine may not tempt you to further trouble, or divertiſement, than ſometimes to diſtil from you a ſhort line of directions, how I may in my beſt capacity ſerve your commands. Theſe and the annexed I have not time to review.

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

Incloſed in the preceding.

Honourable Sir,

THE annexed are only a continuation of the former argument of medicine and ſheep. And this letter muſt be only a duplicate of my laſt boldneſs and importunity. You can better endure ſuch rudeneſs, whilſt it doth heartily proſecute philoſophical deſigns, than compliments, which import nothing but affections and opinion. I urge then again, that you know many hundreds, who can produce more experiments than I can, and of a far more noble nature. And your countenance, or beckoning of your finger, will ſet them all on work. In few weeks I can fill up a quire of ſuch goats hair, as you find. As ſoon as your collector hath culled out from many contributors, as much as will fill up a quire in the preſs, this being printed in quarto; ſo that we, that labour in the work, and all others, may view and review it; by our correſpondents, and further experience,

we ſhall be pregnant for more of the ſame, or like kind, and perchance (by oppoſitions) much improved. And thus it will grow, like a ſnow-ball, by rolling. And this is like collegiate work. The quarto will in ſhort time be many volumes, which any man may buy by parcel, or in groſs, at his pleaſure; and join, or divide, in volumes, as he liſteth.

I TOOK no care of choice, becauſe I refer that as another's buſineſs, and (as I ſaid before) he that brings matter commits no great fault, if he brings rather too much, than too little; and it is better to be too plain, than too curious. And this will diſcourage no hand, that is laid to the work, when every one can do better.

FOR method, I declined it, and oft-times broke it of purpoſe, becauſe change is ſweeter than a continued ſeries of the ſame, or like; and *præter expectationem* more pleaſant than *chorda qui ſemper oberrat eadem*; and thus alſo theſe are topicks for the practice of memory, which is one of my engagements; and if in the end of the experiment there be a *vide* for further reference, this will ſtring them to a fixed method, or note them for various uſes, as far as they deſerve.

THE main point will be in this, that you chuſe a fit collector, who reſides within your reach, that he may receive your frequent directions and caſtigations. And then we ſhall all expect the countenance of your preface. But becauſe it is not reaſonable, that your honour and credit ſhould be concerned in other men's reports of their experiments, I ſhould yield, that our parcels ſhould bear a letter for a remark of his name, who would poiſon ſuch a noble enterpriſe with an untruth. And in the mean time, you may require further ſearch or evidence in any particular, as you ſee cauſe. For example, I thought a cupping-glaſs an eaſy remedy for ſuch horrid epileptical agonies, as ſeemed to all ſpectators diabolical. I made the proof oft-times upon Sir *R. P.* that is (in the ear) Sir *Robert Pye* of the Equerry. We are indeed of neareſt affinity, but for private reaſons I hold no correſpondence with him. Another may enquire of him the place and the matter, and ſee the mark on the place. I conceive it proceeded from a check, that was then put upon his luſt, when the body was pampered with high diet, and other provocations or temptations. And it may ſhew the way of evaporating thoſe tumultuous winds and ſpirits, which are oft-times deplored, as incurable. And I leave to yourſelf the larger inferences.

I HAVE ſometimes interlaced ſmall parcels of hiſtory, that all might paſs like a tale, that is told without much affectation, and yet improve for ſome benefit: and thus it may anſwer to lord *Bacon*'s title, *Hiſtoria, &c.* There is naturally ſomething of more ſmoothneſs and ſweetneſs in ſtory, than in argument. The firſt carries the liquid evidence of things done, and paſt, and therefore paſt diſpute. The other may have nails or talons for the battle, but muſt not anticipate victory and triumph.

SIR, do not you now aſk me, whether you have not other buſineſs more than enough, or whether you need ſuch a ſimple taſk-maſter? I can truly anſwer, that this I had offered for under-work at your ſervice, if in reaſon or modeſty I could have thought one note worthy of your enterpriſe. If you can raiſe any line to ſuch advancement, it is beyond and above my ambition: and yet I do ſtill keep hope, that in ſome following diſcourſes, I may ſerve you in ſome ſmall meaſure. And do not you obſerve the moſt curious artificers lay aſide that, which ſerves not for their maſter-piece, and yet not caſt it away? This frugality is all my ſuit.

BUT yet I muſt increaſe my boldneſs, and intrude upon your own proper taſk. I have ſometimes treated with Mr. *Oldenburg* of the conduct, by which the froth of falſe literature, and ſpawn of the printing-preſs, may be enforced to give way to true light, and ſound information. The term is almoſt paſt, and yet I find not all the effects of my poor advice. Is not the united and conſtant activity of the Royal Society able to communicate the moſt ſeaſonable information of what is abroad? How few members, or how eaſily one member, by few correſpondents, may give intelligence to all the inns of courts, ſee their ſtationers fully furniſhed with a fit ſtore for the buyers? So in the Exchanges, *Weſtminſter-hall*, and all places of conſiderable reſort. The like from *Paul*'s to the univerſities, and all over *England*. And back again the like activity from all ſtationers in the ſkirts of *England* to the metropolis. Here a poor man can awaken *Briſtol*, *Bath*, *Wells*, *Dorcheſter*, and more on the other ſide of *Severn*. This diligence revived every term, and every fair, and in all acts and commencements of our univerſities, will continually increaſe in force. If we call it modeſty, to deſpiſe theſe condeſcentions, we muſt alſo call it modeſty, to renounce our main work. I think I ſee you eaſily, and without any ſtrain of violence, or the leaſt appearance of ambition, give influence to both the univerſities. And then, though *Greſham* hath no ſettled revenues, yet the colleges of under-workmen have fair revenues. And I think it lawful to interrogate, why all our beſt Engliſh preſſes are not already employed upon old, and freſh treaties of nobleſt uſe? Some to revive, compare, and advance *Pancirollus* by later diſcoveries. And as I have moved already for Medicine and Georgics (where I do yet want the reprinting of *Creſcentius*, of which I have ſeen a better copy in the library of *Hereford*, than the common impreſſion, and others) ſo I ſolicit the like hiſtorical collection in all our affairs of art and nature, mathematical, *&c.* I think our credit might extend for the reprinting of theſe Latin authors in the foreign preſſes of the Low-Countries, *Paris*, *&c.* and to take up the Engliſh, at leaſt the academical preſſes, beſides. Theſe high adventures we muſt ſolicit with conſtant activity, and reſolution, to ſtop the current ſtream of impertinent babble, or we ſhall be carried down the ſtream.

SIR,

SIR, when you firſt ſaw me at *Eton*, I was reputed a ſchoolman (though I had then read throughly much more of lord *Bacon*, than is yet printed, having ſeen in manuſcript all his embrio's, his *gradus rerum & gradus verborum*; and the prefaces, and joints, and anacephalæoſis to all his judgments, as lord chancellor; which raiſed me a little above a mere ſchoolman) yet Sir *H. Wotton*, would often pleaſe himſelf in laſhing the ſchoolmen upon my back; and would often declare it as a ſerious prediction, that in this age their reputation ſhould yield to more uſeful philoſophy. (And in his *Reliquiæ* you may find ſome letters, whereof two or three were to my ſelf, and more of the like I have in my poſſeſſion, in which he had our reliſhes, but with more addiction to curioſities) ſo long ago I had my encouragements for this boldneſs; and now the ſeaſon is in full maturity, and you have charged in the van, and we cannot do leſs than to wiſh you good ſpeed.

Honourable Sir,

your moſt faithful ſervant,

J. B.

THE ſheet of goats ſhould follow the fourth of ſheep, as introduced in the laſt clauſe of the fourth.

I TOOK little care to tranſcribe *Columella* exactly, my book being a very falſe print, falſe in moſt periods. And the four old Roman Georgical writers being long ago out of print, excellent matter and authentical Latin, they deſerve an academical diligence for the beſt impreſſion, for which the edition of *Stephanus*, which I gueſs to be the beſt, will give good aid.

SIR, in the paper of coted ſheep, there is an exemplar to a clauſe at the diſcourſe.

Sheep, how to prevent their rot.

THEY yield us the wholſomeſt fleſh, and warmeſt raiment. The ſtaple commodity for trade and manufactures. They feed on our thinneſt paſtures and fallows; and enforce our weakeſt lands to afford us bread and hearty drink. And of ſmall cattle would bring the ſpeedieſt and greateſt gain, if we could be ſafe from the unlucky years of rot; and this we might much more often eſcape, if the owners were not commonly guilty of covetouſneſs, or the ſhepherds of negligence. For hard uſage in the winter, and want of old and dry hay in the months, which are moſt deſtructive to their livers, is the general cauſe of their deſtruction.

Gabriel Plats aſſures us with confidence, taken from the experience of ſeventy four years by himſelf and his predeceſſors (himſelf an eye-witneſs, and diligently obſerving it for twenty four years; and his predeceſſors booking their experience of fifty years) that the only infectious months, that beget the great rot, are May and June, when exceſſive moiſtures befal thoſe months: it is no very great charge to be provided of ſome ſtore of old and dry hay for the time of great moiſtures and over forward graſs in theſe months. And by my own experience for fourteen years at leaſt, in the moſt rotten vales, by a more liberal allowance of hay in thoſe months, I have ſaved my ſmall flocks of the ſheep, which bear the firſt wooll, and are moſt ſubject to the rot, when, for want of ſuch relief, all the ſheep in the neighbourhood round about us very generally died of the rot. And the plenty of moiſture in thoſe months doth always promiſe great ſtore of hay to repleniſh the racks.

THAT fine graſs, which is raiſed by thoſe moiſtures, with the help of hay and dry food, does oft-times fatten the ſheep on a ſudden, and then when the fleece is taken off, it is no loſs, but much gain to put off the fatteſt ware to the ſhambles, as *Tuſſer* in his merry rhimes directeth in general, and particularly for hogs or ſwine, which may more properly be applied for ſheep;

Whatever thing fat is a gain, if it fall,
Thou vent'reſt the thing, and the fatneſs withal.
The fatter the better to ſell or to kill,
But not to continue, make proof, if you will.

As men by a ſudden change from a rank diet to a ſlender fare, fall into the dropſy, ſo will other animals, and ſheep ſooneſt of any.

G. Plats gives it for an infallible ſymptom, that when bees fail, and their hives feel light, a great rot of ſheep is to be expected; which gives a very ſeaſonable warning to bleed the ſheep under the eye, or in the mouth, as oft as they ſee occaſion in the end of ſummer, or in autumn, or to accuſtom them, that are ſuſpected, to lick ſalt in the troughs, or to take ſome brine with ſome dry food, as they may eaſily be trained to it by gentle degrees, or to force down a doſe of ſalt in their throats, as is directed.

IT is by *G. Plats* affirmed, and I find it generally received, that the ſalt marſhes do much help the ſheep; and ſuch as dwell more remote from ſalt marſhes may do their flocks much good, if they can exchange the ſoil, eſpecially for ſounder and drier grounds. And (as I take it) there is ſome good in changing your paſture for a ſhort time, though it be to a worſe ground, if the ſhepherd's care be to bleed the ſheep, that cannot obtain the butcher's purſe and knife.

MY man, that preſerved my flock in a very rank ſoil, was very frequent in opening a vein under the eye, or in the mouth, as ſoon as he perceived a ſheep to droop; and by uſing to look on the veins and red parts about the eye, he could diſcern when a ſheep did want bleeding.

Gabriel Plats takes care to diſtinguiſh what hay is kindeſt for ſheep, and prefers the hardeſt and drieſt before the ſucculent clover, or (as he calls it) the ſilken hay, which is fitteſt for cows and calves. I have often enquired

quired and examined, whether there be not ſome vegetables moſt peculiarly proper for this malady in ſheep, and ſcurvy graſs is moſt proper to relieve the ſcorbutical, *&c.* And a grave ancient miniſter at a great meeting did aſſure us, upon his own experience for many years, that knot-graſs, that had been waſhed twice or thrice, as it grew by the ſea-water, was an effectual remedy. But where ſhall ſuch ſtore of that graſs be found for them, that have great flocks, and far from the ſea? I have ſeen ſome mowing grounds bear ſtore of a yellow ſmall bloſſomed tre-foil, which is very friendly to enliven and ſtrengthen ſheep; when it was green on the ground a fortnight before mowing time, I tried cows and oxen, and they refuſed it by itſelf, and horſes, whilſt they had common graſs, left it; but ſheep did eat it more cheerfully.

I HAVE noted mowing grounds to make ſome change of their graſs, as the years proved moiſt or droughty; and then moſt eſpecially, when the drought or moiſture hath continued two or three ſprings together: (the drought begetting hawk-weed, hard heads, and white bodies, the moiſture increaſing clovers) as I ſhould think by this vale in graſs we may be directed what hay is kindeſt for ſheep. And in that innumerable variety of graſs of all ſorts, we cannot make ſuch choice as if we dealt by retail. We can only take that, which ſeems moſt likely; and other cattle receive no hurt from hay, if it be fine enough: but the cow is weakened by hay, that hath ſtore of cat's tails; and our ſmall ſheep, which bear the fineſt wooll (the ewes at leaſt when they bear lambs) do require the fineſt hay, and ſucculent.

I DO not ſay, that the turf is always altered by drought or moiſture. For I have ſometimes ſeen an unprofitable graſs (as namely peacock's bent) ſo abundantly and pertinaciouſly adhere to a ſoil, that it could not be altered by the fat floods, which every winter were brought over it, till the turf was quite pared off, freſh earth brought in the place, and ſowed with the beſt of Engliſh hay-duſt.

GROUNDS newly laid for paſture are noted to infect ſheep, and I have obſerved ſuch new laid grounds for the firſt and ſecond year to bring forth ſtore of the knot-graſs. But this cannot contradict the former praiſe of ſalted knot-graſs, nor can demonſtrate that knot-graſs is hurtful to ſheep. Poſſibly they may like it ſo well, and find it ſo friendly, that to bite it too near the root, they lick up too much of the ſoil. And if ſheep come to paſture, that was lately flooded, or hath much looſe ſoil on the graſs, they are ſoon tainted.

THOUGH *G. Plats* aſſures upon his hereditary and particular experience of ſeventy four years, that neither the immoderate moiſture of July, Auguſt, and September, nor thoſe kells, which like cob-webs do ſometimes cover the grounds, do beget the rot in ſheep; yet do I much commend ſome careful ſhepherds, who do never ſuffer their ſheep to graze upon the grounds in the mornings, when they do firſt go forth to paſture, nor after rain, before they have been gently driven over their grounds, that their feet may break thoſe kells, and beat off the dews, and overmuch moiſture from the graſs. For that frequent and gentle motion is a ſeaſonable and healthful exerciſe for the cattle, and overmuch moiſture cannot be healthful for ſheep. And the ſheep are a comfort and help to each other, if they accuſtom to gather together in flocks in the time of great rain, and at the time, which may be ſpared from feeding in clammy weather.

IF no hay can be had in thoſe infectious months of over-moiſt May and June, there muſt be ſome eſpecial care to keep the ſheep (during thoſe moiſtures) in the higheſt, drieſt, and ſoundeſt grounds; which may by a little uſe be eaſily diſtinguiſhed from the infectious grounds by the verdure of that ſweet graſs, which tainteth the ſheep; which is not one peculiar herb, as ſome deſcribe it like purſlane, nor as others ſuſpect it to be ſpearwort, though poſſibly ſome emergent plant may be a remark of an infectious paſture.

THERE are many ſalt or brackiſh ſprings in *England*, beſides the Weeches, and more may daily be diſcovered, and much brine may be raiſed by many houſe-keepers. The ſalt water may be boiled and ſcummed, and the brine may be mingled, as I ſaid before, with oats, peaſe, or beans, or enforced in the doſe. Of which ſee *Columella* recited in the end of the following paper.

The government and choice of ſheep extracted out of Columella, *and compared with our modern cuſtoms and experience in* England.

Colum. lib. 7. c. 2. Poſt majores quadrupedes ovilli pecoris ſecunda ratio eſt, quæ prima ſit, ſi ad utilitatis magnitudinem referas.—Tum quod corporibus noſtris liberiora præbet velamina, tum etiam quod caſei lactiſque abundantia non ſolum agreſtes ſaturat, ſed etiam elegantium menſas jucundis & numeroſis dapibus exornat.—As in ſome parts of *Italy*, ſo alſo in ſome parts of *England*, they have a hardy fair ſheep, which with ſome help of a paſture (which may be too thin for the graſing of other cattle) do yield a great relief of milk, which makes a white ſhining butter, ſomewhat like lard, and fit for the hardy labourer; but being mixed with cow's milk, or of itſelf, amends cheeſe: for cheeſe is the better for that rankneſs. *Tuſſer* gives us the ſafe rule, and the juſt proportion.

May's Husbandry.

At *Philip* and *Jacob* away with thy lambs,
That thinkeſt to have any milk of their dams;
At Lammas leave milking for fear of a thing,
Leſt *requiem æternam* in winter they ſing.
To milk and to fold them is much to require,
Except ye have paſture to fill their deſire.
Yet many by milking, ſuch heed they do take,
Not hurting their bodies, much profit do make.
Five ewes to a cow make proof by a ſcore,
Shall double thy dairy, elſe truſt me no more.

Yet many a good houſewife, that knoweth the ſkill,
Have mixt and unmixt at their pleaſure and will.

THIS is no ſmall gain for a ſcore of ſheep to be as good as four cows, where cow-paſture is ſcarce; ſince the plough cannot go merrily, where this white meat is wanting.

Id pecus, quamvis molliſſimum ſit, valetudinis tutiſſimæ eſt, miniméque peſtilentiæ. In hot countries other cattle die more frequently of the peſtilence than ſheep; and in *England* we have ſeen the plague in horſes, and the murrain in other cattle, much more dangerous than the rot in ſheep, which may be cured, or at leaſt prevented, by ſuch help and diligence as is directed.

Verum tamen eligendum eſt ad naturam loci.—Pinguis & campeſtris ſitus proceras oves tolerat; gracilis & collinus quadratas: ſilveſtris & montoſas exiguas: pratis planiſque novalibus tectum pecus commodiſſimè paſcitur.—This *tectum pecus* anſwers to our ſmall ſheep of *Lemſter's-oar* and *Herefordſhire*, which bears the fineſt wooll, and do require all ſummer and winter the ſhelter of warm cotes or houſes. And he alſo diſtinguiſheth them by their countries, *Mileſias, Calabras, Appulas, earumque optimas Tarentinas*, which are the ſame, which before he called *tectum pecus*; ſo we find a difference in the ſheep of *Herefordſhire, Shropſhire, Cotſall, Somerſet, Dorſetſhire*, &c.

HE commends the white as capable of any colour, yet allows *pullum & fuſcum, quos præbet in Italia Pollentia—Nec minus Aſia rutilos. Sed & alias varietates in hoc pecoris genere docuit uſus exprimere.* And here he commends his uncle *Columella*, for joining ſeveral kinds for novel varieties; and this I have ſeen often tried by putting *Cotſall* rams to our *tectum genus*; but except the invention be better, we muſt not boaſt of the ſucceſs.

Ex albo ſæpe fuſcus editur partus, ex Erythræo vel pullo nunquam generatur albus. It ſeems *Jacob*'s luck will always hold, that the black, dark-coloured, pied, or dappled ſheep, will predominate, if any ſpotted males be admitted. Whence he joins with *Virgil*, to examine the very mouth of the male and to ſee that no part of the tongue or palate be ſpotted.

Virgil. *Nigra ſubeſt udo tantum cui lingua palato*
Rejice—ne maculis infuſcat vellera pullis. —

FOR horned or not horned, he prefers the horned as beſt defended in cold climates; not horned, where no fear of hard tempeſts. *Itaque ſi plerumque eſt atrocior hyems, hoc genus (i. e. ampliſſimis cornibus) eligemus: ſi clementior, mutulum probabimus marem.* In *Herefordſhire* the ewes are ſeldom horned; here, in *Somerſetſhire*, the whole flock is horned; which, to our country, would ſeem ſtrange and hurtful.

HE noteth the horned to be more apt to fight, and directeth the ſhepherd to knock nails in a board, and therewith knocking their foreheads, they may be tamed. *Ea res ferum prohibet à rixa, cum ſtimulatum ſuo ictu ipſum ſe ſauciat.* I knew a ſhepherd had his thigh broken, and have heard of others, that were ſlain by fighting rams. To prevent ſuch miſchiefs, I recited *Columella*'s invention. And he addeth from *Epicharmus, pugnacem arietem mitigari terebrâ ſecundum auriculas foratis cornibus, qua curvantur in flexu.*

Ejus quadrupedis ætas ad progenerandum optima eſt trima, nec tamen inhabilis uſque ad annos octo. Fœmina poſt bimatum maritari debet; juveniſque habetur quinquennies; fatiſcit poſt annum ſeptimum. He inſtructeth the buyer to open the wooll, and examine, whether grey be not mingled with the white.—*Variam & canam comam improbabis, quod ſit incerti coloris.* And we ſay, the beſt time to buy them is at two years, and not to meddle with ſuch as are paſt three: the one is not yet ripe for profit, the other is already paſt it.

Eleges bimam vaſti corporis, cervice prolixa, prolixi velli, nec aſperi, lanoſi & ampli uberi; nam vitandus eſt glaber & exiguus. True, this is the beſt choice for *Cotſall-downs*, and the champian commons of *Warwickſhire*; but in *Herefordſhire* we muſt be content with ſmall ſheep with glabious faces, and little or no wooll on their legs or bellies.

FOR cotes or houſes he directs: *Illa etiam tuendis humilia facere ſtabula, ſed in longitudinem potius quam in latitudinem porrecta, ut ſimul hieme calida ſint, nec anguſtiæ fœtus oblidant.* This we approve, that for ſuch as muſt be houſed, the houſes ſhould be warm, but not too cloſe; and that ewes with young, and weak ſheep, be ſevered by partitions from ſuch as are ſtronger.

Ea poni debent contra medium diem. Namque id pecus, quamvis ex omnibus animalibus veſtitiſſimum, frigoris tamen impatientiſſimum eſt, nec minus æſtivi vaporis. This ſhews, that for our ſheep of fineſt wooll, we ſhould take more care in theſe points, than commonly we do.

Deturque opera, ne quis humor ſubſiſtet, ut ſemper quam aridiſſimis filicibus vel culmis ſtabula conſtrata ſint, quo purius & mollius incubent fœta. Herein alſo we are too negligent, moſt of us not cleanſing the cotes, or removing the litter, more than twice in the year; but only overlaying freſh litter: yet, as I take it, *Hereſbachius* directeth, that the floor be ſloping, (ſo it is in ſtables for horſes) that the urine may paſs away before it ſpoils their feet, or fleeces. But to the uſe of fern, ſome of our ſhepherds do ſay, that fern rots ſheep, and ſpoils the dung. And we ſhall be at a loſs, if the urine be not received in litter for compoſt.

Sint quala mundiſſima, ne qua earum valetudo, quæ præcipue cuſtodienda eſt, infectetur uligine. It ſeems, that cleanlineſs, as well as other good winter relief, makes ſheep the hardier to reſiſt the infection in ſpring and ſummer. We uſe a ſort of double cratches, that the ſheep may feed on both ſides, and not leap up on the top of the hay, to foul it with their feet, dung and urine.

THAT thiſtles, burs, and thorny buſhes, are bad gueſts in ſheep-paſture, he confirms, by the authority of *Virgil*; and that a few

ſheep well fed on ſound grounds, are more profitable than larger flocks ill provided. *Nam vel exiguus numerus, cum pabulo ſatiatur, plus domino reddit, quam maximus grex cum ſenſerit penuriam. Sequeris autem novalia, non ſolum herbida, ſed quæ plerumque vidua ſunt ſpinis, utamurque ſæpius authoritate divini carminis*

Si tibi lanitium curæ eſt, primum aſpera ſylva,
Lappæque, tribulique abſint.———

Quoniam ea res, ut ait idem, ſcabras oves reddit cum "tonſis illotus adhæſit ſudor, & hirſutis "ſecuerunt corpora vepres." Cum etiam quotidie minuitur lana, quæ quanto prolixior in pecore concreſcit, tanto magis obnoxia eſt rubis. This buſhy ground then is proper for goats.

THAT the ancients adviſed the uſe of ſalt, and change of paſture, and to avoid uliginous moiſt lands, and to chooſe the fallows for preſervation of ſheep, we may find (and all this together in one period) in *Columella, lib. 7. c. 3. Jucundiſſimas herbas eſſe, quæ aratro proſciſſa arois naſcantur: deinde quæ pratis uligine carentibus paluſtres ſylveſtreſque minime idoneas haberi, nec tamen ulla ſunt tam blanda pabula, aut etiam paſcua, quorum gratia non exoleſcat uſu continuo, niſi pecudum faſtidio paſtor occurrerit, præbito ſale, quod velut ad pabuli condimentum per æſtatem canalibus ligneis impoſitum cum è paſtu redierint oves lambunt, atque eo ſapore cupidinem bibendi paſcendique concipiunt.*

Of ſheep: the rules of the old writers of Italy *compared with the modern cuſtoms of* England.

COLUMELLA makes the queſtion, whether the female ſhould be admitted to the ram in ſpring or autumn, and gives his judgment for the vernal time; that the weather ſheep may gather ſtrength before winter. *Inter authores fere conſtat, primum eſſe admiſſuræ tempus vernum parilibus, ſi ſit ovis matura: ſin vero fœta, circa Julium menſem. Prius tamen haud dubie probabilius, ut meſſem vindemia fructum deinde. Viaticum fœtura pecoris excipiat, et totius autumni pabulo ſatiatus agnus ante mœſtitiam frigorum, atque hiemis jejunium confirmetur. Nam melior eſt autumnalis verno, ſicut ait veriſſimè Celſus, quia magis ad rem pertinet, ut ante æſtivum quam hibernum ſolſtitium convaleſcat, ſoluſque ex omnibus animalibus bruma commode naſcitur.* And we prefer the winter lamb, that is yeaned near Candlemas, as by winter beſt hardned to reſiſt the taint of the ſummer.

THEY had a curious rule of tying the one or other cod of the ram, according as they deſired the lambs ſhould be either male or female; but he rejects it as a troubleſom curioſity. *Ut admiſſarii dexter vel ſiniſter vinculo teſticulus obligetur, in magnis gregibus operoſum eſt.* I have not tried the truth of this rule, but he voucheth *Ariſtotle* for another like curioſity to the ſame effect. *Ariſtoteles, vir calidiſſimus rerum naturæ, præcipit admiſſuræ tempore ſiccis diebus halitus ſeptentrionales, ut contra ventum gregem paſcamus, ut eum ſpectans admittatur pecus; at ſi fœminæ generandæ ſunt auſtrinos flatus captare, ut eadem ratione matrices ineantur.* This I muſt leave as I find it, being by me untried.

WHERE we expect from the ewes milk for the dairy, it is beſt to turn off the lambs to the butcher. *Villicus enim teneros agnos, dum adhuc herbæ ſunt expertes, lanio tradit, quoniam et parvo ſumptu devehuntur, et iis ſummotis fructus lactis ex matribus non minor percipitur.*

HE prefers our own breed of ſheep better than change from remoter places. *Summitti tamen etiam in vicinia urbis quandoque oportebit; nam vernaculum pecus peregrino longe eſt utilius. Neque committi debet, ut totus grex effœtus ſenectute dominum deſtituat; cum præſertim boni paſtoris vel prima cura ſit, annis omnibus in demontuarum vitioſarumque ovium totidem vel etiam plura capita ſubſtituere, quoniam ſæpe frigorum atque hyemis ſævitia paſtorem decipit, et eas oves interimit, quas ille tempore autumni ratus eſſe tolerabiles, non ſummoverat.*

THE ancient and modern agree, that neither the race of the very old nor of young ewes are fit for breed:

AND that ewes do oft-times want the art of Midwifery. *Neque enim aliter hoc animal, quam muliebris ſexus enittitur, ſæpiuſque etiam quantum eſt omnis rationis ignarum laborat, in partu.*

THE nurſing art is curiouſly taught. To caſt away ſome of the firſt milk, and to hold up the lamb to the ewe's udder, preſſing the milk into the lamb's mouth, &c. *Agnus autem, cum eſt editus, erigi debet, atque uberibus admoveri, tum etiam ejus diductum os preſſis humectare papillis, ut condiſcat maternum trahere alimentum: ſed priuſquam hoc fiat, exiguum emulgendum eſt, quod paſtores coloſtram vocant: ea niſi aliquatenus emittitur, nocet agno.*

FOR two days after birth the ewe and lamb ſhould be encloſed together, that the ewe may know her lamb, and the lamb her mother. *Biduo, quo natus eſt agnus, cum matre clauditur, ut et ea partum ſuum foveat, et ille matrem agnoſcere condiſcat.*

HE requires a dark and cloſe pen for the lamb, leſt by too much wanton play they take hurt. *Mox deinde, quamdiu non laſcivit, obſcuro et calido ſepto cuſtodiatur: poſteà luxuriantem virgea cum comparibus aurea claudi oportebit, ne velut pueri nimia exultatione maceſcat.* I have oft-times wondered to ſee the faireſt and moſt ſportful lambs on a ſudden to fall away, wither, and die. The old ſhepherds would perſuade me, they were bewitched; and indeed in old fame young pigs and tender lambs are apteſt to receive miſchief from the envious eye, *Neſcio quis teneros oculus mihi facinat agnos.* But I always ſuſpected this overmuch liberty of ſporting to be for the moſt part the witchcraft.

THE weak lamb ſhould be ſevered from the ſtrongeſt, leſt in ſport they receive hurt. *Cavendum eſt, ut tenerior ſeparetur a validioribus, quia robuſtus angit imbecillum.* We want this care alſo.

HE ſaith it is enough for the lambs to ſuck twice a day. In the morning early before the ewes go abroad; and in the evening when the ewes come full home. *Satiſque eſt*

mane

mane priuſquam grex procedat in paſcua, deindè etiam crepuſculo redeuntibus ſaturis ovibus, admiſcere agnos, qui, cum firmi eſſe cæperint, paſcendi ſunt intra ſtabula cytiſo vel medica, tum etiam furfuribus, aut, ſi permittat annona, farina ordei, vel ervi. Of this we take too little care. Cytiſe and medic we have not, and we ſpare the charges of ground malt, or barley meal. But ſome ſhepherds provide ſtore of miſſeltoe, and ſmooth leaves of holly, for the ewes, and the fineſt graſs for the lambs, and bran, and, as I ſhould think, ſome flour of peaſe, oats, and fitches ſhould not be too coſtly. And ſome admit the lambs to ſuck thrice a day, in the morning, at noon, and evening. And as ſoon as the lambs have fit ſtrength they go in the paſture with the ewes, (but not ſo early) to learn to feed. *Ubi convaluerit, circa meridiem pratis aut novalibus villæ contiguis matres admovendæ ſunt, et à ſepto emittendi agni, ut condiſcant foris paſci.*

FOR food in this time of milk for lambs, he adds the leaves or ſmall branches of elm, and aſh, or hay of the latter mowing, and barley, peaſe, and beans, if not too coſtly. *Aluntur commodiſſimè repoſitis ulmeis, vel ex fraxino frondibus, vel autumnali fœno, quod cordum vocatur: nam id mollius, et ob hoc jucundius quam maturum: cytiſo quoque et ſativa vitea pulcherrime paſcuntur: neceſſariæ tamen, ubi cæteræ defecerint, etiam ex leguminibus paleæ, nam per ſe ordeum et freſſa cum ſuis valvulis faba, vel cicercula ſumptuoſior eſt.*

COLUMELLA with *Virgil*'s authority directs the time of feeding and of watering the flocks—*Luciferi primo cum ſidere*—From our *Ogleby* it is thus our own ſtyle.

At the firſt dawn in cold grounds let them feed,
Whilſt day is young, and pearled is the mead,
When dew to cattle dear on ſoft graſs lies,
And the fourth hour heat muſters from the ſkies;
And amongſt ſtubs the murmuring graſhopper ſings;
Command thy flocks then to the lakes or ſprings,
Or let them taſte ſweet ſtreams in pipes convey'd.

FIRST this is beyond our ordinary diligence in this colder climate. Secondly in this account the morning is more friendly to ſheep, than we do commonly eſteem it—*Et ros in tenera pecori gratiſſimus herba eſt*; and *Gabriel Plats* aſſureth, that it is the rank graſs, and not the dews, that does the hurt; yet he taketh ſo little care for the watring of ſheep, that he ſaith, they may live altogether without it, and care not to drink except they ſee water. But for ewes, that give milk, it is in all reaſon fit, and may deſerve *Virgil*'s item.

At cui lactis amor cytiſum, lotoſque frequentes
Ipſe manu ſalſaſque ferat præſepibus herbas,
Hinc et amant fluvios magis, et magis ubera tendunt,
Et ſalis occultum referunt in lacte ſaporem.

BUT this in *Virgil* is rather meant of the goats, than of ſheep, but may well belong to both; for in thoſe old days, as well as in theſe, ſalt had the reputation to preſerve the health of ſheep. And I conceive *Markham*'s directions in that point may be conſiderable. He tells us, that where the ſea-water hath waſhed the marſhes, the ſun dries it into a reddiſh ſalt (by him called ſal alderſe, or ſome ſuch name) which is peculiar for the recovery of ſheep. May not this ſalt be eaſily gathered on the ſea-coaſts, and at eaſy rates?

BUT for watering in the evening we have the ſame double authority,

Solis ad occaſum, cum frigidus aera veſper
Temperat, et ſaltùs reficit jam roſcida luna.

COLUMELLA's caution in hotter countries may advertiſe us in very hot ſeaſons; *ſed obſervandum eſt ſidus æſtatis per emerſum caniculæ, ut ante meridiem grex in occidentem ſpectans agatur, et in eam partem progrediatur, poſt meridiem in orientem. Siquidem plurimum refert, ut paſcentium capita ſint obverſa ſoli, qui plerumque nocet animalibus oriente prædicto ſidere.* It is better to be ſo curious, than be too negligent.

FOR warm lodging and fodder in winter we may join with *Columella*, as far as our frugality will permit, and can eaſily obſerve the reſt: *Quare etiam frigidis humidiſque temporibus anni ſemel tantum ei poteſtas aquæ eſt faciendâ.*

No fierce driving. *Tum qui ſequitur gregem circumſpectus ac vigilans magna clementia moderetur, idemque duci propior quam domino.*

HE gives not the ſhepherd leave to lie down, but to ſhew his face for a comfort to thoſe melancholic cattle. *Neque ab his aut longe recedat, nec aut recubet, aut confidat. Nam niſi procedat, ſtare debet, quoniam grex quidem cuſtodis officium, ſublimem celſiſſimamque oculorum ſpeculam deſiderat, ut neque tardiores et gravidas, dum cunctantur, neque agiles et fœtas, dum procurrunt, ſeparari à cæteris ſinat, ne fur aut beſtia hallucinantem paſtorem decipiat.* And we add, that ſinging, whiſtling, piping, and other muſick is phyſick againſt their natural melancholy, and for us men alſo, if in the lays of old *Tityrus*.

COLUMELLA preſcribes many old and excellent and curious medicines for the peculiar diſeaſes of ſheep, Lib. VII. c. 5. But every ſhepherd ſhould be always provided againſt the common diſeaſes: of rankneſs of blood, which makes them drop down, and die immediately; againſt the ſcab, begotten by hard winter and poverty. For which the uſe of tobacco and ſufficient dry food and ſhelter exceeds all old receipts; and againſt ſores and wounds eaſily healed with tar; and againſt giddineſs and weakneſs of the liver begetting the rot, againſt which juniper berries have a peculiar commendation, and may be added to the former preſcriptions againſt the rot. The worms and diſeaſes in the feet may by art be cut out, and healed with tar, alum, and liquor. The fever by letting blood between the claws in the feet, or under the eyes, or ears. Why ſhould we ſpare the blood of a ſheep (the moſt general and moſt effectual remedy)

remedy) when our care of ſheep is not for their long lives, but for their fat, fleſh, ſkin, and fleece?

Of coted ſheep.

De Ovibus Tectis, Colum. l. vii. *c.* 4.

NEITHER here nor in my former, do I take theſe words, *Of coted ſheep*, to be the genuine and proper tranſlation of *Columella*'s title, *de ovibus tectis*; but I uſe the word only by way of alluſion, becauſe, as their ſheep in *Italy*, which bore the fineſt wooll, wore coats or covering garments, to defend them from heat of ſummer, and the cold of winter, and for the improvement of wooll, ſo, in *England*, our ſheep, which bear the fineſt wooll, have cotes or houſes for their defence all nights, winter and ſummer, and in the ſaddeſt days of winter. Of the ſheep, which bear the coarſe fleeces, we take not that care in moſt places of *England*.

THAT theſe *oves tectæ* had ſome covering beſides their own fleeces, may appear by theſe words of *Columella*, l. 7. c. 4. *Liberis autem campis, & omni ſurculo ruboque vacantibus ovem Græcam paſcere meminerimus, ne & lana carpatur, & tegumen.* And more clearly in the foregoing chapter, *Quanto lana prolixior in pecore concreſcit, tanto magis obnoxia eſt rubis, quibus velut hamis inuncata, a paſcentium tergoribus avellitur; molle vero pecus etiam velamen, quo protegitur, amittit, atque id non parvo ſumptu reparatur.*

FROM whence I deem it worthy our enquiry, whether we in *England* may not make a conſiderable improvement of our wooll, if we covered our ſheep, and took the other aids for the fineneſs and growth of wooll, which we ſee preſcribed by the old writers; and poſſibly ſome new aid we may find, which excels their aids. And again, we may enquire, whether it might not be available (in theſe times of general commerce by the benefit of navigation) to furniſh thoſe Engliſh counties, which yield the fineſt wooll, with thoſe kind of ſheep, which were clothed. Or at leaſt (as *Columella*'s uncle did, l. vii. c. 2.) to get rams of this fineſt kind. For to the Italians it was not then the native ſheep, but (as *Columella* ſays) *Græcum pecus, quod plerique Tarentinum vocant.* And we ſee how the ſilk-worm hath travelled from the Eaſt through *Perſia* and *Italy*, both weſtward and northward, even to our cold and watery climate, if we ſo pleaſed.

AND ſurely it would be ſome conſiderable reward for a ſhepherd's diligence, if he could make his ſheep bear ſilk, and keep them ſafe alſo; and I make no doubt, but we may have ſuch ſilk from our ſheep, as may paſs for the ſilk of the old teſtament, ſuch as was uſed for the tabernacle in the Levitical rites. For (as judicious interpreters do acquaint us) the ſilk ſo often mentioned in the old teſtament, as pertaining to the tabernacle, or to the temple for Levitical rites, was not the ſilk of the worm, which was an unclean infectile, and therefore unholy; but was ſome fine cotton, or fine wooll, as it is expreſly called by the author of the epiſtle to the Hebrews, c. ix. v. 19. "with water and ſcarlet wooll, ἐρίῳ "κοκκίνῳ." For ſome wooll contends for fineneſs with ſome cottons, and ſome hair contends with furs or wooll for fineneſs, and ſome furs, ſome wooll, and ſome cottons do approach as near to the ſilk of the great Virginian ſilk-worms, as that ſilk approacheth to the ſilk of *Naples*, *Perſia*, and *Armenia*. We ſee how mohair and Turky-ſtuffs bear the gloſs of ſilk in ſome dies; and ſome calicoes and taffanies, and new ſtuffs, make us doubtful, whether they are of ſilk, or cotton, or whence the materials. And the furs not only of bevers, but of rabbits, and of many vermin, but chiefly of the black fox, do claim a precedence before ſome ſilk. The beaver is fit not only for hats, but for gloves and other garments, eſpecially looſe garments. How far other down of fowls, and of vegetables, and feathers, may by art be brought into uſe, who can foreſee? But now we have gone a wooll-gathering.

THAT we may weigh what Engliſh countries were fitteſt to try the ways of improving wooll to a ſilken fineneſs, I can only give account of *Herefordſhire* wooll, and chiefly there of the wooll of *Lemſter's-oar*, and *Urchinfield*, by which all that pretend to fineſt wooll may compare their own. That which deſerves properly the name of *Lemſter's-oar*, is ſold commonly about thirty ſhillings, ſometimes thirty two ſhillings the ſtone, which weighs twelve pound of ſixteen ounces to the pound: the beſt of *Urchinfield* not frequently above twenty ſix ſhillings the ſtone. The common wooll of other parts of *Herefordſhire*, about twenty ſhillings the ſtone. And the wooll, that fails there of that rate, we call coarſe wooll, or Welſh wool. Though yearly the price may alter ſomewhat, yet this for many late years hath been the proportion: and being our ſtaple commodity, we may the ſafer fix a rate, but I have not the ſkill to proportion it with the rates of wooll in other countries, which had been a clearer guide in this queſtion.

I KNOW, that wooll and ſilk do altogether differ in kind; but wooll is a curled fur, or curled ſilk; and herein I ſend a lock, which I did cut from a negroe's head, to ſhew how like it is to our black ſheeps wooll in *Herefordſhire*.

THUS our fine woolled ſheep, though they be natives, and Engliſh, not of the Greek kind, yet they require ſome of the ſame tender care; but not ſo much curioſity. Whence I infer, that it may be of ſome avail to make known to our beſt and moſt curious huſbands in *England* the great diligence and induſtry, which Italians uſed to preſerve ſheep, which bore the fineſt wooll.

COLUMELLA'S firſt words are a kind of diſcouragement, *Græcum pecus, niſi cum domini præſentia eſt, vix expedit haberi; ſiquidem & curam & cibum majorem deſiderat. Nam cum ſit univerſum genus lanigerum cæteris pecudibus mollius*

mollius tum ex omnibus Tarentinum eſt molliſſimum, quod nullam domini aut magiſtrorum inertiam ſuſtinet, multoque minus avaritiam; nec æſtus nec frigoris patiens. But for this we have a ſatisfying anſwer, that *England* is full of wealthy farmers; and in the countries, which bear fineſt wooll, generally all farmers and maſters do over-look their own flocks, or both their ſhepherds and flocks; and many do live at a higher rate, than to meaſure all things by profit. Some expence and diligence is ſacrificed to elegancy and curioſity, with this inſcription; *viderit utilitas.*

Raro foris, plerumque domi alitur, & eſt cibi avidiſſimum, cui ſi detrahitur fraude villici, clades ſequitur gregem. There is little danger of this amongſt us, but the contrary. For our farmers do hold by another tenure, than their ſlaves and villains. Our farmers are the true owners of the flock; and ſuch as have the ſpecial charge of the ſheep, are more apt to rob their maſter's barns for too much and too coſtly grain, than to defraud the ſheep.

FOR their allowance in food, I may ſave the labour of tranſlating it, for I doubt I ſhall find few diſciples. *Singula capita per hyemem rectè paſcuntur ad præſepiatribus ordei, vel freſſæ cum ſuis valvulis fabæ, aut cicerculæ quatuor ſextariis, ita ut & aridam frondem præbeat, aut ſiccam vel viridem medicam cytiſumve, tum etiam cordi fœni ſeptena pondo, aut leguminum paleas affatim.*

THEY muſt not think of fatting lambs of this race for the butcher, nor of milk for the dairy; and when any lamb is weaned or ſold, or miſcarries, the ewe may join to help to give milk to ſome other lambs, which thereby ſucks of both. *Minimus agnis vendundis in hac pecude, nec ullus lactis reditus haberi poteſt: nam & qui ſummoveri debent, pauciſſimos poſt dies quam editi ſunt, immaturi fere mactantur; orbæque natis ſuis matres alienæ ſoboli præbent ubera: quippe ſinguli agni binis nutricibus ſummittuntur, nec quicquam ſubtrahi ſubmiſſis expedit, quo ſaturior lactis agnus celeriter confirmetur, & parta nutrici conſociata minus laboret in educatione fœtus ſui: quam ob cauſam diligenti cura ſervandum eſt, ut & ſuis quotidie matribus, & alienis non amantibus agni ſubſumentur.* We are not often wanting in any of theſe points.

HE adviſeth to rear, or breed up more males for theſe, than for coarſer flocks, with this peculiar reaſon, becauſe the rams are gelt for weathers, and ſent to the ſlaughter-houſe, about two years old, and their fleeces ſold at higheſt price, as bearing the fineſt wooll. *Plures autem in ejuſmodi gregibus, quam in hirtis maſculos enutrire oportet; nam prius quam fœminas inire poſſint mares caſtrati, cum bimatum expleverint, enecantur; & pelles eorum propter pulchritudinem lanæ majore pretio quam alia vellera mercantibus traduntur.* And thus we prefer weathers, both for the fleſh, and for the fleece.

BUT now follows a cluſter of curioſities; how to make the fleece grow finer, and alſo more abundantly. *Nam ſæpius detergenda, & refrigeranda eſt; ſæpius ejus lana diducenda, vinoque & oleo inſuccanda: nonnunquam etiam tota eſt eluenda, ſi diei permittit apricitas: idque ter anno fieri ſat eſt; ſtabula vero frequenter everrenda, & purganda, humorque omnis urinæ divertendus eſt, qui commodiſſimè ſiccatur perforatis tabulis, quibus ovilia conſternuntur, ut grex ſupercubet, nec tantum cæno at ſtercore, ſed exitioſis quoque ſerpentibus tecta liberentur.* This puts me in mind of the diligence, which ſome of our gentry do uſe for their cocks, hawks, dogs and horſes. He requires the like care for theſe ſilken ſheep, that they be often rubbed, and refreſhed, and (their wooll being divided) dreſſed with wine, and oil ſoaked in, ſometimes waſhed (which ſhould be done thrice in the year) the ſtable or cotes kept very clean; the urine always drained away at holes in the planks underneath; no dung left there, nor harbour for ſerpents.

YEA, and their houſes oft-times perfumed alſo to expel ſerpents, as he directs in the ſtile and joint authority of *Virgil.*

Diſce & odoratam ſtabulis incendere cedrum,
Galbaneoque agitare graves nidore chelydros:
Sæpe ſub immotis præſepibus aut mala tactu
Vipera delituit, cœlumque exterrita fugit,
Aut tecto aſſuetus coluber.

INSTEAD of the ſmoke of cedar, we in *England* may uſe juniper, which in ſome barren lands ſuperabounds; or, in want of that, *Col.* recommends burnt hair, or burnt horn.

HE preſcribes a medicament, wherewith to anoint new ſhorn ſheep for increaſe of wooll, and the fineneſs of it. The decoction of lupines, with the lees of wine and dregs of oil, and after four days to plunge them in ſea-water, or (if that cannot be had) in rain-water, in which brine is decocted. *Hoc modo curatum pecus anno ſcabrum fieri non poſſe Celſus affirmat; nec dubium eſt, quin etiam ob eam rem lana quoque mollior ac prolixior renaſcatur.* This alſo may here be altered for our lees of ale, and ſuch liquor as the kitchin affordeth; and inſtead of lupines, which is not common with us, why not a decoction of beans, or ſome other grain?

AFTER all this care for the ſofteſt ſheep, and fineſt wooll, I muſt vouch *Virgil*'s authority, that the ſtinking goat yields as much of the ſweet gain, as any ſheep, and then *dulcis odor lucri.*

Hæc quoque non cura nobis leviore tuenda,
Nec minor uſus erit, quamvis Mileſia magno
Vellera mutentur, Tyrios incocta rubores.
Denſior hinc ſoboles, hinc largi copia lactis:
Quam magis exhauſto ſpumaverit ubere mulctra,
Læta magis preſſis ſpumabunt flumina mammis:
Nec minus interea barbas, incanaque menta, &c.

WE ſee, that reddle makes the wooll grow finer, and reddle being cheap with us, many do reddle the ſheep all over, and repeat it often.

Of Goats.

To a very ſkilful farmer I deplored his ſad condition, that his lands were all under the curſe of thorns, briers, and brambles, barren clifts, and rocky hills; not a ſhred of cow-

paſture, and the fields ſo light, ſtony, and ſandy, as to refuſe or burn out the heart of wheat, peaſe, *&c.* He anſwered, that (beſides the unknown treaſures, which he hoped lay under that diſheartening turf) he found a relief from it beyond the belief of beholders. For his light and ſandy land bore turnips, potatoes, and other bulbous roots, as well for food, as for ornament; for odoriferous vegetables, and beauties, that this light land was kinder than the ſtrongeſt land in the vale. That his wife or his boy could with eaſe turn up the ground with a hand-plough, or pare off the turf of one piece of ground to redouble the ſtrength of another. That his furzy ground (being torn up) would yield fuel to repay the workmen, and ſome kinds of corn for ſome years, and afterwards (being ſown with the ſeed of the largeſt French furze) would ſuddenly become a wood, as rich as any coppice-wood, and the proverb ſecures for the moſt parts of *England*, that an acre of coppice-wood is as good as an acre of wheat land, if not much better.

To this I replied, But where is the ox-paſture to maintain the plough? or where the cow paſture, to yield milk, butter, and cheeſe? Where is the timber?

FOR timber, he pointed to groves of free holly (ſo they call holly, that hath no prickles, but one at the point) and this (ſaith he) is ſtout and tough timber. Every leaf is a hearty and juicy food for the cattle. It challengeth the bays, and all other verdant beauties of the garden, by affronting the froſt and ſnow of winter, with her fiery cluſters. If the ground be a while ſevered from the teeth of cattle, we can raiſe theſe groves faſter, and frame it into ſtronger fences and hedges, than of any other ſhrub. And now for cow-paſture (ſaith he) here is richer paſture, and richer ware, than that vale does yield, pointing at a ragged, buſhy, rocky hill, where a herd of goats graſed.

I WISHED, that there were a ſevere law for the exterminating of thoſe beaſts of poiſonous breath and teeth from all parts of the land, where a quickſet-hedge could grow. To this wiſh, he conſented heartily, but ſaid in good earneſt, that to him they ſeemed a richer cattle than cows. For cows required flowry clover by the river banks all the ſummer, warm houſes, good fodder, and coſtly attendance all winter. Whereas goats thrive beſt in a buſhy ground, that would unfleece the ſheep, and yield no graſs for larger cattle, and the winter cold they can bear with little charge of relief or attendance. And better they deſerve a park pale, than the nobleman's deer, or coney. But are then moſt profitable, when a poor boy may keep them in herds on the rocks, mountains, and wild or waſte lands, for the relief of the neighbouring poor. And many ſuch waſte lands there are in *England*, *Wales*, and *Scotland*. From whence by theſe herds more Chriſtians may be cheriſhed to ſerve God, and (as we ſay in *England*) the king may increaſe the number of his ſubjects. And it is the main point of agriculture, that we ſort every ſoil to the beſt benefit; and he is the beſt republican, who deviſeth ſuſtenance for the multitude, and raiſeth the moſt profit from the worſt land.

OF old, indeed, Romans, in their wealthy *Italy*, had ſuch eſteem of the profit of theſe herds, that *Varro* tells us of a Roman knight, who, in his days was allured (by the ſweet gain, which he found by a ſmall herd) to advance to a thouſand in the herd, lib. ii. *c.* 3. *Is (viz. Gaberius Eques Romanus) tum in ſuburbano mille jugerum haberet, & a caprario quodam, qui adduxit capellas ad urbem decem, ſibi indies ſingulos denarios ſingulos dare audiſſet, coegit mille caprarum, ſperans ſe capturum de prædio indies ſingulos denarium mille.* What this denarius would value of our money, we ſhall not eaſily gueſs. For though our monetary criticks do render it ſeven-pence halfpeny, yet who can ſay, how near that may amount to one, two, or three ſhillings, if he conſiders how much a penny or ſhilling of Engliſh money hath altered in three hundred years, and the like of foreign alterations?

AND although *Gaberius* had no good ſucceſs in his exceſſive covetouſneſs, yet we ſee, how much the poor may be (and yet many more might be) relieved with their ſmall herds, which would be a ſmall taſk for ſuch as do want employment; and he, that keeps thoſe herds from wandering, or doing annoyance, may uſe his knitting-pins (which alone ſuſtains moſt of the people (male and female) men, women, and children, in *Parſhowe*, a town in *Worceſterſhire*, and may addict to many other manufactures. However, this ſhall encourage me to ſelect from the old Roman huſbandmen a few rules of directions, concerning them. And this is their firſt praiſe, that a few and ſimple directions will be ſufficient.

VARRO, by his own choice, prefers a male goat for every ten females. *Alii ad denas capras ſingulos parant hircos, ut ego: alii etiam ad* XV. *ut Menas: nonnulli etiam ad viginti.*

FOR a herd, he adviſeth to confine towards the number of fifty, or, as he ſaith, *in Sallentinis, & in Caſinati ad centenas paſcunt.* I conceive the greater number of them cannot be ſo dangerous, or ſo inclinable to infections in *England*, as in thoſe hot countries, where they are never free from a fever. *Capras ſanas ſanus nemo promittit, nunquam enim ſine febre ſunt.* I know many herds, and the pooreſt do adventure for them, and I never heard them complain of their loſs by fevers, or contagion. *Quid dicam de earum ſanitate, quæ nunquam ſunt ſanæ? niſi tamen illud unum, quædam ſcripta habere magiſtros pecoris, quibus remediis utuntur ad morbos quoſdam earum, ac vulneratum corpus (quod uſu venit iis ſæpe) quod inter ſe cornibus pugnant, atque in ſpinoſis locis paſcuntur.* However the rule is good, that we rather get many herds, than great herds, which are apt to beget the peſtilence. *Itaque greges plures potius faciunt, quam magnos, quod in magnis cito exiſtat peſtilentia ibidem.*

DR. *Moffet*, a rare and excellent phyſician, comparing the ſeveral milks, ſays, that for ſome aſſes milk is beſt, for others cows milk,

for

for ſome goats milk, becauſe the one cleanſeth, the other looſens, and the third ſtrengthens more than the reſt. Goats milk is better for weak ſtomachs, becauſe they feed on boughs more than graſs. Sheeps milk is thicker, ſweeter and more nouriſhing, yet leſs agreeable to the ſtomach, becauſe it is fatter. Hence I collect, that ſheeps milk being fatter than cows milk, and goats milk finer, they may well be contempered together. And twenty ewes and ten ſhe goats would be a good ſuſtenance, and make a dairy for a cottager, or poor farmer. And ſome ſuch mixture ſeems requiſite, ſince goat's of itſelf is apt to beget the louſy diſeaſe, as Dr. *Moffet* exemplifies in the ſad example of the lady *Penruddock*, p. 125.

MOFFET prefers the fleſh of black and red kids before the white, and the kid to be of eaſy digeſtion, of excellent nouriſhment, and reſtorative after great ſickneſs; better roaſted, than ſod; and hinder parts better than fore-parts, and beſt under ſix weeks age. A gelded goat is next to the kid, but ſhould be baited, or hunted, then blooded, and when dead, the fleſh muſt be beaten in the ſkin, after the French manner of beating a cow, (ſaith *Moffet* more eſpecially of the old he goat and ſhe goat) and then ſeaſoned with ſalt and pepper, and baked, it makes a luſty kind of baſtard veniſon for the hard labourer.

VAR. l. ii. c. 11. finds good uſe for goats hair for navies, for warlike engines, for veſſels. *Capra pilos miniſtrat ad uſum nauticem, ad bellica tormenta, & ad fabrilia vaſa.* We in our days have amplified the uſe of worſe hair for hats and other garments, as alſo for bed coverlets.

COLUMELLA, Lib. VII. c. 6. confirms the former, by recommending them to ſhrubby, buſhy, and thorny wild grounds. *Nam nec rubos averſatur, nec vepribus offenditur, & arbuſculis, frutetiſque maxime gaudet; ea ſunt arbutus atque alaternus cytiſuſque agreſtis, nec minus ilignei querneique frutices, qui in altitudinem non proſiliunt.* Becauſe this wilderneſs is ſo kind for goats, it is not amiſs to advertiſe of the ancient diligence, which planted cytiſus; and it is now more eaſy by our hand plough to tear up ſome furrows, and ſow them with hips, haws, ripe holly berries, acorns, aſhkeys, and bramble berries, and to ſave them from cattle, till they are got up a little. To encreaſe their milk, *ſuper lactis abundantiam ſamera, vel cytiſus, vel hedera præbenda, vel etiam cacumina lentiſci, aliæque tenues frondes ſunt objiciendæ.*

THE ſkins of kids and goats do grow every day more precious, as we do grow in our ſkill of dreſſing them, and colouring them.

COLL. l. vii. c. 7. gives this general rule for medical, that as ſoon as one falls down of the peſtilence, or murrain, all ſhould be blooded. Nor they ſuffered to feed all day, but reſtrained four hours of mid-day.

IF other diſeaſe invade them, *ſi alius languor infeſtat, pabulo medicantur arundinis, & albæ ſpinæ radicibus, quas cum ferreis pilis diligenter contuderimus, admiſcemus aquam pluvialem, ſalamque parandam pecori præbemus.*

FOR the dropſy, *ſub armo pellis leviter inciſa pernicioſum tranſmittat humorem; tum factum vulnus pice liquida curetur, ibid.*

IF the female be troubled with the bearing or after-birth, a draught of good ale, cyder, or wine, will do good, *defruti ſextarius, vel cum id defuerit, boni vini tantundem faucibus infundatur, & naturalia cerato liquido repleantur, ibid.*

IF nothing elſe will, the butcher's knife cures all their diſeaſes, and is then beſt in ſeaſon, when the fleſh, fat, and ſkin are ſaved.

VAR. l. ii. c. 3. *Capræ a carpendo nominatæ. Horum enim dentes inimici ſationis, quas etiam aſtrologi ita receperunt in cœlum, ut extra limbum 12 ſignorum excluſerint.* And ſo ſhould we exclude them from all woods, groves, or hedges, that are worthy our care. For as well holy prophets, as heathen poets do juſtly reſemble them to devils, as proper for the vale of miſery, and land accurſed.

Experiments moſt part medical or chirurgical, Nov. 9, 1663.

ABOUT ſeven years ago, as I ſat at dinner, and drank in a ſilver tankard, I felt ſomewhat like a flie's rough claws faſtned in the paſſage of my throat. Suddenly I caught away the tankard, and ſtrained my breath with my utmoſt ſtrength and ſpeed, and therewith did blow out a great ſpider, which ran on the table before the eyes of all that ſat there. This was in a well ordered family of careful and cleanly people; yet this fell out like an advertiſement to prefer clear glaſſes, before goblets of gold or plates of ſilver. And health and life is concerned in ſuch circumſtantial deliverances, as much as in medicine, or chirurgery. And I think this land and climate does not breed ſtronger or quicker poiſon in any vegetable, animal, ſerpent, or inſectile, than in the ſpider, though I have heard of ſome men, that can eat and digeſt ſpiders; and I have ſeen young turkeys eat them for an antidote, and particularly when ſtrawberries, (either in kind, or in quantity, as cauſing a ſurfeit) was their poiſon, and had killed many, that had not eaten ſpiders. But I muſt never record this deliverance without the ſacrifice of my heart in praiſes to the ſupreme Lord and governor of the world, whoſe influence gives life, motion, and activity to every creature, and very peculiarly to ſuch, as acknowledge his ſuperintendance, abſolute dominion, and inexhauſtible goodneſs; to ſuch moſt eſpecially in the hour of need.

A GENTLEMAN of great parts obſerved to me the preſentneſs of ſpirit, and rationable conduct, that ſome have more than others in ſurpriſing diſtreſſes. He ſaw a man thrown off a great horſe, his head falling under the horſe's forefeet, and the hooff pitching upon one of his eyes. The man's hand was ready to defend his face (which is a natural motion) and perceiving the horſe's hoof coming juſt in his eye, with a vigorous thruſt of his hand,

he turned the hoof aſide, and ſo ſaved his face. I have ſeen very many eſcapes by quick and unexpected activity; and many ſore miſchances by notorious dulneſs, and negligence. I ſaw a proper youth (his legs ſliding from under him in a ſhelving deſcent at the head of a pond) ſuffer himſelf to be tumbled headlong into the pond in very great danger. An old man ſtood by me, and both of us with much wonder noted, that he made no renitence with hand, or foot, or other part of his body. For which ſtupidity the old man gave him afterwards ſuch impreſſive reprehenſions, as might add laſting metal to his ſpirit. And I ſaw a goodly perſon, of very great fame for his valour and ſtrength, caught by his foot in the ſtirrup at a latchet-pin in a park gate (all made very ſtrong) and the horſe in a gird of ſpeed ſo diſtended, that we all expected he ſhould be torn to pieces. It was his mere negligence to be thus involved; and he had no other remedy, but by a quick activity to caſt himſelf behind the ſaddle, and off the horſe. And (as I noted before of vomiting) there are more points of activity do belong to man's ſafety, and credit, than thoſe, which conſiſt in leaping, running, and fencing, *&c.* And the promptneſs of ſpirit is for general uſes better than a dexterity in athletick exerciſes. But above all it is ſafeſt to make our frequent and conſtant refuge to the altar of God, who makes his angels miniſtring ſpirits for our good. And this is the catholick and univerſal medicine.

IT is not civil language in theſe days to ſay, that the maniacal, lunatic, epileptical, ecſtatic, or convulſive, are poſſeſſed with devils, or unclean ſpirits; yet judicious *Mede* hath proved the holy ſcriptures ſometimes to uſe that language indifferently, as *termini convertibiles*; and ſome very learned perſons of late are engaged to make all theſe ſymptoms merely natural, others ſtrain all their operations to be ſupernatural, divine, and forſooth prophetical. But of this we may take good notice, that in all ages of the remoteſt antiquity (not only amongſt God's people, Abrahamites, Iſraelites, Jews, and Chriſtians, but alſo among Egyptians, Aſſyrians, Greeks, Romans, Barbarians, and Savages) in the application of medicine the moſt famous phyſicians did moſt ſolemnly invocate the great name of Jehovah, not only for the cure of theſe peculiar maladies, but generally of other diſeaſes. Of which cuſtom ſomething is collected by *Grotius* in *Matthæum*, Cap. XII. ver. 26. *A dæmonibus ad morbos quoque mos tranſiit.—Ejuſmodi ergo exorciſmi eventum ſæpe ſuum habuerunt, non quod vis ulla in ſyllabarum pronunciatione ſita eſſet, ſed quod verus Deus illis potiſſimum nominibus noſci appellarique vellet, atque ideo vim ſuam tum demum exſereret, cum apertiſſima locutione conſtaret ipſum, non aliquem gentilium Deorum, eſſe invocatum.* This he takes to be our Saviour's argument there, and that the true God would bear witneſs to his own name (when he was acknowledged the God of *Abraham*, *Iſaac*, and *Jacob*) all over the world. And that the true God will more truly and effectually hear our prayers to aſſiſt the health of mankind, than ſuch idols, devils, and unknown genii, as were worſhipped by ſavages, we may juſtly confide. Of exorciſms I muſt not interpoſe any judgment of mine own, but I refer the intelligent to the argument, as it is handled by the learned and judicious Dr. *Field on the Church*, where the judgment and practice of the primitive church is recited with the joint teſtimony of all the holy Fathers of beſt ages. And ſomewhat we may find amongſt our Canons and Conſtitutions eccleſiaſtical, Engliſh 72. (where in old prints I have read the word exorciſe, in later prints exerciſe) in concurrence with the proteſtant churches, which follow the Auguſtane confeſſion. And *Grotius* tells us in *Mar.* xvi. v. 17. that old miracles are not in theſe days exterminated, if our faith were not firſt exterminated. *Sed nos, cujus rei culpa eſt in noſtrâ ignaviâ aut diffidentiâ, id ſolemus in Deum rejicere; ſunt autem* ἀμετομέλαλα τῦ Θεῦ δῶρα. But to forbear the high language of exorciſms, and of miracles, is it to the credit of proteſtants, if Jews, Mahomedans, and Romaniſts, do refer more to the efficacy of faith and prayers in deſperate diſeaſes, than they, the reformers, do ordinarily? Do not acute diſeaſes oft-times lye in ſuch diſguiſes, as may need more of divine than of human conduct, more of the happineſs than of the art or force of the phyſician, chirurgeon, or application: and we ſee, how the critical ſtate may alter in a moment; and that may now be an antidote, which, within an hour before or after, might be furious poiſon. And we have many inſtances, which do import, that in our days, ſome have the gift of healing, though perchance not in the ſame vigour as in the apoſtolical age. *Reſponderi poteſt, non quidem tam frequentia et conſpicua eſſe, quam olim fuere dona ſanationum: attamen Deum nunc quoque piis, quorum ſaluti id expedire judicat, ſæpe morbos auferre, aut mitigare:* ſaith *Grot. in Annot. ad Caſſand. De unctione infirmorum.* And is it not more of mercy and charity, to offer ſomewhat of the good Samaritan's oil (as St. *James* directeth, ch. v. 14.) and at leaſt to ſolicit εὐθανασίαν, than to fly the field, and to forſake the patient in his greateſt exigence, as it is the manner of ſome phyſicians, leſt they ſhould loſe the reputation of doing more than they can do, or ought to be done in this vale of mortality.

A GENTLEWOMAN of rare beauty loſt all her fair roſes and complexion by conſumptive coughs, rheums, and green-ſickneſſes. For remedy ſhe followed the famous phyſicians of *London*, and thereabout, ſome years in vain. I perſuaded her to take, as hot as ſhe could well drink it every morning, a full draught of the decoction of centaury boiled in beer or ale, and to walk after it: ſhe did it heartily for a fortnight or more, recovered her roſes, was married, hath children, and continues in health theſe fourteen years ſince, this being her only medicine at the firſt, and in all relapſes.

THE blood is purged, and melancholy abated by a like infuſion of fumiterræ, either warm or cold, as ſoon as the plant appears in ſpring. The head freed from vapours by wild betony; and ſage-ale is proper for the aged, when ſubject to rheumatick defluxions from the brain. Balm ale a cordial; and the like I could experimentally affirm of ſeveral vegetables very effectual againſt long radicated maladies, by a conſtant uſe of them infuſed in our ordinary drink. And a palate hardened to bear the hop and tobacco may as eaſily endure any other horrid guſt, of which kind I account centaury the moſt intolerable: in compariſon of which, wormwood is pleaſant, and by uſe becomes more agreeable than the hop or olive, as appears by the teſtimony and practice of many of the gentry in *Hereford*, and *Herefordſhire*, who do generally prefer the wormwood beer of *Trehern* the girdler, before other beſt ale or beer, although their palates are much accuſtomed to a very pleaſant winy cyder. Of theſe vegetables I ſaid as much before, but in this I chiefly intended this note, that in the late times of war and heavy payments, many, whoſe livers by grief and diſcontent became very weak and tainted, and many ſcorbutically affected, were healed and recovered by the uſe of this wormwood beer. And it is ſomewhat conſiderable to find ſuch ſtore of medicine, as may heal the epidemical diſeaſes for all the town and country, without charge upon phyſicians and apothecaries, if they can forgive this fault. And, if we had a medicine, that would heal a rot in ſheep, what is it worth if it be ſo coſtly, or ſo ſcarce, that it may not or cannot be applied to the infected flock?

I HAVE known more than one excellent phyſician, who conceived, that moſt of our worſt maladies had ſomewhat of ſcorbutical malignity, and did frequently apply ſomething anti-ſcorbutical. For their ſakes, that are of this opinion, or for them rather that are afflicted with this malady, this experiment I offer, as thoroughly and often tried, that when all other medicines of current note failed to cure the ſcurvy, a draught now and then of the juice of oiſters taken out of the ſhells, after they were ſtewed, and a cup of wine after it, ſpeeded the cure. This took up my wonder, becauſe I found oiſters irritate the malady; but the fleſh of the viper rebateth the poiſon of the viper. Such as are afraid of chalybeat medicines, vitriol, and *Matthews*'s univerſal pill, or do loath the ſcurvy-graſs, may perchance find their palate pleaſed at this news, and allow themſelves the variety, and ſauce of the juice of oranges added to it.

HOLY thiſtle decocted in clear poſſet-drink was heretofore much uſed at the beginnings of agues, fevers, unknown diſeaſes, and eſpecially if there be any ſuſpicion of poiſon or infection; and *Alexis* of *Piedmont* ſo highly extols it, as if it were an univerſal medicine. It inclines to a gentle ſweat, or perſpiration, and purgeth by urine, anſwering to the ſignature (as generally thiſtles do) as if the prickets opened all the pores to emit the obnoxious humour; and this in my experience I have ever found to be the friendlieſt way of evacution (as before I noted in *Matthews*'s pills.) And again about five years ago, the holy thiſtle recovered the former reputation, when agues and fevers were epidemical and obſtinate, and of more than ordinary malignity. By this and other like changeable valuations of medicines, it ſeems, that we follow the faſhion, as well for choice of medicines, as for ſhape of hats and breeches.

I COULD not gueſs, why ground-ivy (called in old Engliſh tudmore) ſhould now be called ale-hoof. But I hear it ſerves ſome ale-wives to out-run the exciſe-peeper in clarifying their new ale, as ſoon as it is brewed, in one night, and ſettles diſturbed drink, and gives no offenſive reliſh to hinder the ſale; and then it is one of the general friends of nature, which evacuateth (by urine) rheums, poiſon, and vapours, that offend the head, ears, and eyes, *&c.* And however the hop carries the bell at this time, yet the friendſhip of burnet, angelica, and of lilies of the vale, is beſt known in white and Rheniſh wine, *&c.* And it is needful an ingredient ſhould be generally friendly, before it be entertained epidemically in our daily diet.

WHEN I was an *Eton* ſcholar, I fell very ſick. Our ſchoolmaſter Mr. *Buſt* ſent Dr. *Hector* to me; he tells me, I muſt be let blood, and take a vomit: I deſired gentler handling, for that I had never tried either of thoſe remedies. The doctor draws out his money, and tells me I muſt have a double fee for teaching him his art; but (ſaith he) the ſchoolmaſter ſent me to give you phyſick, and not to receive your inſtructions. But I held my reſolution to adventure upon an unknown malady, rather than upon two ſuch violent remedies. Within three days it appeared a tertian ague, which by regular diet, gentle ſweats, and ſome patience in reſiſting the fits, with walking in the time of the viſit, was ſubdued within three weeks. And as long as we have ſtrength to make any ſuch reſiſtance, I ſhould prefer that method in agues before any violent repercuſſions, though it were by the famous *febrifuga* called Jeſuit's bark: but in the concernment of agues, I account him happy, that can with moſt eaſe, and thoroughly diſcharge his ſtomach.

AT *Orleans* in *France* I fell extreme ſick in a high burning fever, which ſurely was peſtilential, and ſo our phyſician told us; and three of us Engliſh fell ſick together in one houſe, as infecting one another. Monſieur *Du Cheſney* was our phyſician, and indeed ſhewed us the office of a ſkilful, careful, and honeſt phyſician. He viſited all of us, as we fell ſick in order, twice or thrice every day; ſaw the vein opened, or gently breathed (a little at a time) and no oftner than needful. He aſked each of us, whether we ever loſt blood before; and we anſwering no, he cheared us with ſome confidence under God's mercy of our recovery. By which received rule, it ſeems good not to be prodigal of blood with-

out urgent cauſe. He overlooked our diet, allowing nothing but French barley broth, and ptiſan during the effervescence of the fever. Was always preſent when any potion was given. Took great care for our reſt and quietneſs by the ſilence of the houſe, and all attendants; forbad viſits. After all his care, he would receive but a ſmall ſum. For myſelf, I could not faſten on him any reward. He accepted of ſome poor trifling ſcribbles, as if they had been a reward. And the like kindneſs I have received from Dr. *Smith* of *Shrewſbury*, and from Dr. *Harford* of *Hereford*. Yet from my heart I can plead in the behalf of ſuch careful, honeſt, and ſkilful phyſicians, that no honour, nor reward, that this world can yield, is a full and ſufficient reward for them. A good magiſtrate gives life to the people, and they by God's bleſſing preſerve the life of magiſtrate, and people. But never was there any ſuch cruel and mercileſs tyrant on earth, as is an unſkifull or diſhoneſt phyſician, or chirurgeon. To conſume our ſubſtance, and to fill their own purſes, they tear our fleſh, corrode our bones, and torture us in all our parts and vitals for days, weeks, and months together, even whilſt we fly to them for aid, and whilſt they ſmile in our faces with all ſweet promiſes of affectionate care. But it ſo fell out in heaven; a collapſed angel is a devil.

ABOUT the end of February, above twenty years ago, as I was riding from *Cambridge* towards the weſt, I fell into ſuch deep and dirty ways in *Wiltſhire*, that I and my horſe were quite tired. With much ado I got to an inn, and to bed I haſtned, where the fever tormented me all night, increaſed all day, and thus for two nights and two days, worſe and worſe. I ſent for the miniſter, and prepared to take leave of this world, for I had no hope to ſurvive, till a phyſician could come thither, if I ſhould ſend for one. And I had no other thoughts, but to end my pain with the end of my days. Some good people of the houſe boiled a handful of currants, of violet and ſtrawberry leaves, each a handful, in a quart of running water, boiling it to a pint, ſtrained it, and adding ſome good quantity of ſugar-candy, gave it me to drink hot. I drank it at a draught, and fell into a ſweat after, and ſoon found my head eaſed, and other kind operations of nature. Two days after I took a gliſter, and ſo by ſoft degrees (after a fortnight's weakneſs) I recovered.

I HAVE always found, that beef is too ſtrong and rank for my ſtudious kind of life; (of pork and bacon I complained before, and it is more offenſive.) At *Eton* college we had no beef but only on Mondays at dinner, yet that filled my noſtrils with rank vapours for two days after: at *King's-College* in *Cambridge* we had beef frequently, and that continued ſome puſtles under the corners of my noſtrils, or about my mouth, or chin. Some others, though very temperate, had more enflamed faces from the ſame cauſe, as I conceive; and took much phyſick, ſtill ſuſpecting ſome heats or inflammations of their livers: and thus ſometimes we deſtroy ourſelves by medical enforcements, and by ſtraining at impoſſibilities. For if our ſpirits be vehemently fervid in ſtudies, reading, writing, compoſitions, hot arguments and meditations, it is hardly poſſible, that they ſhould aſſiſt digeſtion, as in ruſtics and day-labourers. We diet cocks for the pit, and horſes for the race; and the old Romans beſtowed aſcetical diet, and oils on their fencing ſlaves for the ſtage. Our ſerious ſtudies do better deſerve that care.

IT was reputed of old a point of paſſive valour (an eminent virtue) to ſuffer chirurgery, as occaſion required, ſtoutly. *Epaminondas* and *Marius* were famous for it; and *Jack Ellis*, the cook of *King's-College*, diſdained to be bound, whilſt his leg and knee were ſawed off. But I have heard of a lady, that ſuffered a long tormenting death, rather than the chirurgeons ſhould ſearch her wound, (and ſhe hath ſome praiſe for her reſolved modeſty) and that the truly noble Sir *Philip Sidney* refuſed chirurgery with this ſentence, *Non tanti eſt in hac arena vivere*. And death is ſometimes as welcome as ſweet ſleep to a weary traveller; *Quale ſopor feſſis in gramine*. The return to life by ſome enforcements brings the horror of pain, as the witty lord *Montagne* deſcribes it by his own experience.

I KNEW a gentlewoman of great underſtanding, and very devout, not in much talk and ſingular notions, but in fervent and perpetual prayers and deeds of charity. She lived to a great age, and practiſed medicine and chirurgery to all the neighbourhood, above ſixty years. I never heard her blamed by phyſician, chirurgeon, or patient. For ſhe would always refer the rich (in fit caſes) to the profeſſed artiſt; and was ſo noble, that ſhe rejected all kinds of gratuities. Her conſtant ſucceſsfulneſs begot my belief, that ſhe had an extraordinary gift of healing. And ſurely the late counteſs of *Kent*, and ſome princes and perſons of honour and quality now living, do deſerve from us mortals our beſt laſting monumens, and will receive from God everlaſting rewards for their bounty, charity and care in this kind. For their gifts are better than gold (as our Saviour and his apoſtles, and ſome old prophets, by their obliging examples do ſhew) and then ſuch charity will ſurely obtain the greater reward. And it is God's goodneſs to encourage theſe worthies to prevent the cruelties of lucrative and diſhoneſt practitioners.

The conduct of fame, or communication for the advancement of learning, arts, trade, and accommodations of all ſorts, &c.

Yeovill, Nov. 21, 1663.

Honourable Sir,

IN my laſt I did ſolicit the conduct of literary and accommodable communications. Now I intend to produce an example of the

effects and benefits, that may be expected from it. Sir *H. Wotton* would ſometimes ſend out all his train of attendants, to try, how far we could raiſe ſuch rumours as he directed; and what return we could make of current news, provoking our emulation to prove our wits and capacities by our ſucceſs, allotting our particular walks, ordering what fame we ſhould correct, and giving us the form and ſtile (in ſome variety) of our reports and of our enquiries. We could ſoon find out the chief newſmongers and receivers in *Weſtminſter-hall*, the *Exchanges*, famed ordinaries, taverns, carriers-inns, ſtationers, and concerned relations in courts, inns of courts, ſhops of trade (the barbers and baladry not neglected.)

I THEN ſaw, how few men could regulate and create fame, and the dangerous influence of fame, if not regulated to honeſt deſigns. Of itſelf, it flies and gives ſtrength or weakneſs to government, as it were by chance. Being guided, it ſerves to noble ends. He ſaid, it was great *Cecil*'s main engine (far and near) in the moſt publick concernments.

I INFER, how proper this care may ſometimes be for our purpoſe of obliging accommodations, and in the way of literature. Let me offer an inſtance upon my laſt argument of wooll, which I ſent to you by carrier on Monday laſt, and by this time hath over-filled your hand, as I fear.

ABOUT eight years ago there was a wager laid by the clothiers of *Worceſter*, that they would make richer and finer cloth of *Herefordſhire* wooll, than could be made of Spaniſh wooll. What the wager was, or who won, or who the adverſaries, I do not know. But an honeſt clothier told me, that the Worceſter clothiers joined purſes, art, and rural aid for the victory; and beſtowed ten pounds on ribbands to bind up their cloth; which may ſignify, that they ſpared not coſt and care to win the prize. I wiſh better ſpeed to theſe kinds of emulation (both in our own country, and towards foreigners) than to any cock-fight.

AND ſuch honourable families, as wear the richeſt cloth, may eaſily continue this emulation: for advancing the wooll I have put in my mite in the forementioned diſcourſe, both from the old, and new aids; and that will encourage the improvement of drapery; and that again the dyer's art. And he, that would bear on his back the teſtimony of his good ſucceſs, or happy choice, muſt buy the uncoloured cloth in one place, and the beſt dye in another, where either is more excellent.

I REMEMBER, when I was a young ſcholar in *Worceſter*, I noted the clothiers generally to remark what gentry wore cloth; and them they reputed patriots and Engliſhmen: which ſeemed to exclude the ſilken gentry from that eſtimation. I do not join in their opinion; for the king's cuſtoms being advanced, and commerce encouraged, by the ſilken courtiers, it is another luſtre to the nation: yet the coldneſs and moiſture of our climate, at leaſt winter's rage, and the old formalities of honour and quality in our peers, and princes, judges, and all lawyers, citizens, and heretofore of our academicans, agree with our ſtaple intereſt in ſheep, and wooll. And yearly to beſpeak ſome of the beſt cloth, that *Worceſter*, or other clothing towns can make, begetteth fame, emulation, art and induſtry. And then a treatiſe of any helpful directions, becomes acceptable and ſpreading. And this will excuſe the vanity of coſtly garments in the ſight of God, and good men. And this is more than a ſhort blaſt of fame. This is exemplary, and like our Saviour's ſermon of humility, when enlivened with the fit emblem of a child placed in the midſt of company. This will encourage ſome to take care for the fineſt wooll, ſome for the moſt perfect drapery, ſome for the dyer's ſkill; and will (by competition) ſolicit manufacture; in which we did once excel, but do now yield to other foreign nations.

I WOULD yet particulariſe, that we have ſtore of horſes from *Barbary*, Spaniſh genets, courſers of *Naples*, Flemiſh mares: and why none of thoſe covered ſheep, tranſported from *Greece*, *Sicily*, or other parts of *Italy* or *Spain*, and wherever this fineſt wooll is to be found? What more eaſily tranſported than rams, whoſe ſoundeſt food may be carried with them, and whoſe beſt medicine is the ſea-water? And a few rams may alter a flock of ſheep. I have heard of rams bought by wealthy perſons to enlarge their ſheep, of four pounds, yea of ten pounds price; but I have not yet heard of any very high price, or any extraordinary care for to purchaſe the rams of fineſt wooll. Hence, in behalf of trade in general, and of our ruſtical intereſt, and alſo of our ſtaple commodity, which is of no ſmall concernment to *England*, I would humbly propoſe two enquiries to the Royal Society: 1. Whence, or how, might we get rams of the fineſt wooll in the world? 2. By what application might the wooll be moſt effectually improved in fineneſs? In my ſlight papers, I recited out of *Col. l.* 7. *c.* 4. a mixture of decoction of lupines, with old wine, and lees of oil, wherewith their bodies ſhould be anointed, as ſoon as ſheared; and after three days plunged in ſea-water, or bathed in brine (and in *Herefordſhire* we ſay, reddle mingled with liquor, and the ſheep twice or thrice in the year therewith anointed) *ob eam rem lana quoque mollior, atque prolixior renaſcatur.* But, to the main point, what kind of liquor, whether gooſe-greaſe, which beſt helps the ſpinners; or badgers-greaſe, which beſt helps the dyer, but begets moths, if not by ſome way of antidote perfectly waſhed; or whether train-oil, or whether any other mixture of the green of hemlock, or white hellebore (both in ſome caſes recommended for ſheep by *Columella*) whether of theſe, or what elſe more effectual, I refer to better enquiry.

AND further I would humbly move, that in all our undertakings in the Royal Society, we ſhould do the like. Each member, in his proper capacity, ſhould, at certain times, propoſe, how any art, ſcience, trade, or manufacture,

facture, might be improved, reſtored, or revived: what old books are fit to be reprinted, what new to be extracted, or advanced: what means to engage the fitteſt preſſes. Some things I know we ſhould manage in ſecret; ſome on the houſe-top: and ſometimes the dial is viſible, when the ſpring is covered and caſed. And thus (with your favour) as a few chief perſons preſcribe the faſhion to the court, and the court to the gentry and kingdom, which is the viſible dial; ſo, by a like countenance of unexpenſive commands to the chief towns of trade, the Engliſh manufacture may be encouraged, and yet the deſign ſcarcely diſcerned. And the honeſty of ſuch a deſign, which brings work and relief to ſo many poor, will heal the tranſgreſſion of luxury, and convert our coſtly raiments into a publick bleſſing. And herein alſo we may act our parts in purifying the ſtreams of literature, and in diſtributing light of the beſt value.

SIR, to explain and confirm all this in a concluding word: if others would endeavour for mathematics, ſome for ruſtical affairs (and that had been my element, if I had been my own man) ſome for artifices, and ſo in all other things, as you have been pleaſed to contribute towards chemiſtry, medicine, and the other great and ſecret works of nature, we ſhould ſoon accompliſh beyond the Verulamian vote, and do things worthy of the Royal Society. But I perſevere in overcharging you with too many troubles.

Honourable Sir,
your moſt humble, and
moſt affectionate ſervant,
BEAL.

SIR, that of late my pen hath cumbered you with many repetitions, I could excuſe it by my ſpeed and buſineſs, which allows me no ſecond thoughts, nor copies, nor ſo much as an engagement of my memory; but I may ſay, that the beſt of poets and orators, and the moſt inſpired oracles, do condeſcend to ſuch inculcations. And my lord *Bacon*, in his few works, hath given us the ſame precedent oft-times. This I hope you will pardon in buſineſſes, which require importunity.

THESE with my humble ſervice, and entreating the conveyance of the annexed alſo.

Yeovill, Dec. 14, 1663.

Honourable Sir,

NO man did ever ſo much moleſt you with the vileſt trifles, as if I made it my ſtudy to find out what are the moſt vulgar matters. In very truth I do ſo. And yet I do boaſt theſe trifles ſo highly, as if they were the moſt proper and the moſt expedient ballaſt for the invincible ſhip of the Royal Society, that ſuch owls as cannot behold the day-light of your microſcopical, magnetical, chemical, and mathematical diſcoveries, may taſte the benefit of your condeſcenſions in georgical and ruſtical affairs.

AND I have a zeal, that no man's pen may rob the Royal Society of this glory. And I hear, that many perſons of eminent honour amongſt you have afforded your countenances in it; the honourable *Charles Howard*, yourſelf, Mr. *Evelyn*, and many others, have vouchſafed your regards to it. And in the annexed waſte ſheet, for gardens, which ſays nothing but *hoc age*, you find it the greateſt improvement of land, the fulleſt reward of huſbandry, the ſpeedieſt return, the ſafeguard againſt dearth, the cleanſer of noiſom towns, and the healer of infectious air. Hence the tables of princes (by an anniverſary, or monthly ſupply) may be ſtored with infinite varieties of delicacies; and hence the poor man's hunger is at cheapeſt rate ſupplied; the artificer's and huſbandman's labour ſtrengthened; and the yeoman's powdered beef and ruſty bacon ſweetened and relieved with healthful ſauces, hard-headed cabbages, and roots, that give more vigour than beef itſelf. Would you try how the fruit of your noble accommodations ſhould appear, the very next ſpring and ſummer, you ſee, it is no more, but at ſeveral of your meetings to propoſe, where the beſt ſeeds of all kinds may be acquired; what kinds newly diſcovered, and fit to be recovered; old and new, delicate and healthful. You are ſo many illuſtrious and ſplendid perſons, as are able to give law and mode, faſhion and reputation, to ſuch diet and raiment, as ſhall be moſt for the publick behoof. Our nobility was wont to applaud the Italians, as the beſt exemplars of elegancy: may we not with good pretences to ſobriety, reduce our carnivorous tables to their patterns of ſalads; or at leaſt to the French *quelques choſes?* And I hope my noble friend Mr. *Evelyn*, whilſt he reads, *Col. lib.* x. *Hortorum quoque te cultus Sylvine docebo*, will catch up ſuch a full inſpiration, as will enforce him upon the argument, and not allow him to diſdain the gods of *Egypt*, onions and chebbolds, and leeks, the princely ſtandard of *Wales*; and *(ne quid præfiſcine ſit dictum)* that he begin with a ſacrifice to the hunger of the common people, before he offers his elyſium at the altar of princes.

AND that would give life and eternity to ſuch a diſcourſe, or book, if ſome day or ſeaſon were anniverſarily deſigned for that peculiar argument, which every year will become freſh by introduction of more foreigners. And to beſpeak the beſt ſeeds, and to appoint where they may be had upon ſure truſt, makes this negotiation abſolute and perfect. We have here gardiners, that pay an hundred pounds yearly to workmen; if they ſhould fail of true and right ſeed, it would undo them. Hence they are conſtrained to truſt their own ſeed, though their ground requires change, and moſt plants (if the ſeed be not renewed) do degenerate; of ſo much concernment is ſafe and truſty recommends.

IN the other animal ſheet, I proſecute the benefit of communication, and in few heads,

without

without choice do exemplify, how much the publick might be obliged, if ſome perſon, that hath fuller information, than I can have, and that hath leiſure to review the ancient, ſhall fit the foreign and old aids, for our preſent occaſions. If the witty thrift of every Engliſh county were known, and practiſed in every county, *England* would have another face, much more wealth than now it hath. And it is hard to determine, whether the old aids reſtored would not equal all, that can be learned from the foreign parts of the world at this day known.

LET me entreat your patience, that I may fill this paper with an old ſtory. That learned *Roman*, who began the firſt period of his ruſtical diſcourſe with this account of his age. *Annus nonus octogeſimus admonet me, ut ſarcinas colligam ante quam proficiſcar e vita*; he recommends the dance of *Orpheus*, which you find mentioned in the end of the ſheet of poultry. And again lib. iii. c. 17. *De piſcinis*, exemplifies the like obedience of fiſh in fiſh-ponds and lakes, which may be in the ſame grove. *Quos ſacrificanti tibi, Varro, ad tibicinem Græcum veniſſe dicebas, &c.* Here we have *Orpheus in Sylvis, inter Delphinas Arion.* By the experience I made in my childhood, I know, how eaſy it is to get an abſolute command over beaſts, birds, and fiſhes; to keep them at what diſtance we pleaſe, or to draw them to any degree of familiarity. I tried it then upon bulls, boars, keen maſtiff-dogs, ferrets, carps, and other inhabitants of water and land for uſe, and for ſportful entertainment. The kindneſs of a lamprey (which is a kind of water ſerpent) was of old famous.

WHEN my brother *T. B.* was ranger of *Wakefield-lodge*, one ſpring there came up from his large fiſh-ponds a hoſt of black frogs, or toads, newly ſtripped out of their tadpole ſkins. They covered all the ground for two furlongs diſtance, and entered into his gardens, and all the rooms of the houſe like the plague of *Egypt*. I perſuaded my brother to buy good ſtore of ducks, and get ſtore of wild ducks eggs hatched for thoſe ponds. He did ſo, and preſerved his gardens, and deſtroyed all theſe ſkippers and crawlers, and was never after moleſted with ſuch an ugly viſit, having improved his ſtock of ducks into a pleaſant and profitable duckoy. Here he had bitterns, herns, moor-cocks, fowls of all ſorts, not quite wild, becauſe he permitted none to moleſt them with gun or other open violence, and almoſt at call by ſome kindneſs of frequent relief. And you ſee, the old learned *Varro* was not aſhamed to patroniſe this kind of ruſticity. And my tale is well ended, if it procures another collector of better advertiſements; and that the Royal Society do allow an anniverſary ſeaſon for rural accommodations, and freſh communications. And poſſibly this point of philoſophy, and *Ariſtotle*'s tractates of animals, plants, &c. is as conſiderable as his Organon, Phyſicks and Metaphyſicks, which take up all the ſtudies of our academies. And may not this wild kind of aviary appertain to my honoured Mr. *Evelyn*'s ſylva, as the apiary belongs to the culinary garden? But with all this tedioufneſs I muſt end abruptly, only adding, that if the Royal Society ſhould think fit to allow a ſeaſon for ruſtical reviews, I conceive the fitteſt time would be in autumn, or ſpring, or both.

Honourable Sir,

your moſt affectionate ſervant,

J. B.

Yeovill, Jan. 11, 1663.

Honourable Sir,

I SUSPENDED the acknowledgment of your laſt obliging favours, till I could give ſome account of the iſſue of mine own eſſay. With the mixture of water I filled the cane with quickſilver on Wedneſday laſt, and did not reverſe it, nor veſſel it, till late on Saturday. And then (by a miſchance in the reverſing) I was conſtrained to repleniſh a foot length in the cane, which I did very careleſly at two or three haſty pourings, yet then it reſted near thirty inches, and on Sunday morning compleated thirty inches. But then there was a miſling of ſmall rain in the morning, and thick clouds all the afternoon. And it mounted an eighth or ninth higher, after the rain, than in the time of rain; and ſo this morning it ſunk an eighth or ninth in the very time when hard rain fell. By which it ſeems, that the clouds, before the rain fell, lay heavier on the air, and compreſſed it more, than when they were diſſolving, and the air intermingled with the falling rain. But I do, as novices are wont to do, and haſten to a reſult, before the conſtancy of the experiment be confirmed.

I AM very glad, you met with that ſtrange phænomenon, that ſuch a ponderous ſubſtance as mercury, in ſuch quantity, ſhould refuſe to deſcend without the compreſſion of a bubble of air, and yield to ſuch a ſmall motion. I may ſuggeſt to you many enquiries; of which there occurs to my mind at preſent *Gilbert*'s apprehenſion, "that a ponderous body, if elevated above the terreſtrial "magnetiſm, would have leſs propenſion to "deſcend. And whether, beſides the want "of compulſion from the bubble, and the obſtruction of air, and terreſtrial ſteams in "the orifice, the mercury and all groſs bodies "have not inviſible claws, or ſuch ſtrong "ſteams in the next approach to their bodies, "as may faſten in the circumjacent pores of "the glaſs; and ſince mercury hath no very "briſk tumult of parts, whether each particle "may not ſomewhat (though weakly) adhere to other." We ſee ſmall drops of mercury will adhere on the outſide of the glaſs. And leaf gold will adhere by innumerable particles, and fly up and down in the air, as if it ſought for ſome neighbouring body,

which if it meets, it will offer at ſome hold; and the branches of vines, Roman beans, and hops, will ſo feelingly ſearch out for ſupportance, as if they had animal perception; theſe for any dry ſtick; and goards and pumpions for a pot of water. As if their effluvia correſponded, and gave notice, where their auxiliaries quartered. But will not water or mercury more eaſily deſcend out of a narrow cane on plain ground, than on a pharos? Or has the cane, and materials of the pharos a more ſtrongly approaching magnetiſm, than will yield to the predominancy of plain ground?

SIR, you have tempted me to this boldneſs; for novices, when they begin to taſte ſomething in philoſophy, cannot govern their appetites. I am not altogether ignorant of my ignorance, but can diſcern, how eaſily I may raiſe queſtions and propoſals upon falſe grounds; yet I pray you allow me a little to wander, as *in itinere ecſtatico*.

LAST autumn I ſaw (near a great buſh of roſes) many very ſmall ſpiders, and they ſeemed to fly in the air, yet had no wings. I had formerly repreſented to Mr. *Pell* the ſpider's mechanical riddle, as it is explicated, and in effigy illuſtrated by *Blancanus* in *Ariſt.* Loc. Math. pag. 212. *Araneorum induſtriæ*. But here to my eye the ſpiders viſibly exceeded the conceit and draught of *Blancanus* very much. For theſe ſpiders did ſwim and glide in the air, up and down, as fiſhes do in the water, as eaſily and as ſwiftly up as down. Truly, a nimble youth might more eaſily catch the flying butterflies, than theſe. When my hand ſtruck at them, they fled upwards over my head, ſwifter than ſome flies; and in this ſwift eſcape they ſpringed upwards in guirds, as larks do, and ſeemed to take the ground of their leap from the web, which they did caſt out of their mouths to their feet. And when they ſaw themſelves out of my reach, they would ſometimes fix in the air, as a kite does. And then I thought on a fat bulky fellow, that without motion of hand or foot (by mere extenſion of thoſe ſinews, which are in the main bulk of his body) ſwims and floats on the waters in the Bath. A ſpider is one of the beſt mechaniſts amongſt our viſibles; and every animal activity puts me in mind, what air, fire, and other inanimates may do. And in that phænomenon I think as well of the ſpring of mercury, as of air; and all things, as well as ſpiders, ſeem to have webs, and claws, though of ſeveral kinds.

SIR, will you now ſuffer me in this wild voyage to aſk, "whether you have at *Greſham* "tubes of tin, or white iron, of thirty one "foot length, to which are firmly ſoldered "ſtrong glaſs canes of four or five foot length? "one fixed, and remarked to the only uſe of "comparing (by ſome tinged water, or other "liquor, that would eſcape freezing) the "gravity of the air with the humours of the "Torricellian mercury." For, beſides that (as I gueſs) the degrees of change may at ſome ſtair-caſe, or balcony, be made more viſible; poſſibly it may ſometimes diſagree with the peculiar humours of mercury. Another like tube to examine what kind of liquors will aſcend higheſt, what apparent difference in waters, healing and poiſoning ulcers; in waters, that bear ſoap for the laundreſs, and ſuch as refuſe it; in waters, which corrupt the colour of beef and other meat in boiling, and make them inſipid, and in others of better fame and ſalubrity, ſuch as aſſiſt the brewer, and ſuch as rob him; ſuch as ſerve the dyer for this or that colour; to view by the ſteams, as well as by weight, coherence, and conſiſtence, ſuch waters, as are brought freſhly reeking from tepid fountains. Have you capacious glaſſes and exact ſcales fitted to weigh the common air uncompreſſed at ſeaſons, which perplex the Torricellian device; and to weigh all liquors? Alſo ſmall glaſs canes of divers ſizes, to try the diverſity of all waters and liquors, in the ſeveral degrees of their fluidity. By theſe and ſuch like aids, which will occur to yourſelf more abundantly, we may find more of the differences and qualities of waters and liquors (and poſſibly ſometimes of air and winds) than are diſcoverable by the thermometer, Torricellian mercury, or the pneumatic glaſs; and knowledge of water and ſubterraneous veins, by which they are conveyed, may to vulgar hands be more popular, and have more obliging utilities, than of air. As whether water by bottelling (and coverture in ſprings or ſand) gets more or leſs fluidity, or conſiſtence, weight, or levity; what by boiling, *&c.* We ſay, that ſprings iſſuing from mineral veins do give in ſhort time a reddiſh tincture to the oaken leaf. Some ſprings are known to have ſuch conduct, and by comparing the properties of ſuch waters, they may learn to gueſs at the ſubterraneous veins. We have here (within a flight ſhoot) two very fluent and ſalubrious ſprings, differing in many qualities very much from each other; and both as much from a ſpring, which is in my garden, which gratifies the brewer, and corrupts all fleſh, that is watered or boiled in it; and (hard by) a ſearching unfreezing water, which tingeth all ſtones with the colour of ruſty iron, and is therefore called *Ruſty-well*. Not far off, an excellent eye-water. By Mr. *Oldenburg*, in my laſt, I gave notice of a water at my couſin *Robert Seymore's* at *Hampford* in *Dorſetſhire*, which (to mine own, and generally to other guſts) improves malt to a third of quantity. If this may be found true, and the like in many other places, it may oblige brewers, and good houſewives. Poſſibly you may deem it worthy your ſteward's enquiry, and may direct him to examine probable cauſes. The gentleman is of eaſy acceſs, and hoſpitable. I have under hand an experimental ſearch in general after the cauſes, or nourices of ſprings, which I intend you by the next; and then for ſoil and compoſt, with a ſpecial eye to your commands, "touching the more ca-"tholick ways of acquiring our dominion by "advancement of huſbandry," if God permit and enable.

WHEN

WHEN we have found ways to diſcriminate the obvious properties of water, then we may further expatiate upon many ſtrange qualities of it in all parts of the earth; and may find better healers, than the pool of *Bethesda*, and greater wonders. But I am almoſt by experiments convinced, that if the poor would take knowledge, and accept of that ſtore of help, which God doth in very many places offer them, they might thence partake of a greater kindneſs, than the phyſician, ſurgeon, or apothecary will afford them, when they have ſpent all their ſubſtance.

Publica morborum requies, commune medentum
Auxilium, præſens numen, inempta ſalus.
ſaith *Claudian* of his *Aponus*.

SIR, having thus far trifled about curioſities of weights and meaſure, I wiſh the virtuoſi of *Italy*, *France*, and *Germany*, by amicable correſpondence, would agree with us for ſome academical ſtandard. For it ſeems to me as improper, that we ſhould uſe domeſtic meaſures, in addreſſes to foreigners, as to write in ſecretary or chancery hand. And I would propoſe, that ſince *Rome* was the laſt miſtreſs (of *Europe* at leaſt) we ſhould in literary communications uſe the *Roman* foot and meaſure, ſo exactly examined by *John Greaves*; or (at firſt) offer the debatement, who could give a more probable light to the ancient meaſures and weights; and it might be a fortune to an ingenious artificer to furniſh us, in box and braſs, with ſuch meaſures exactly ſubdivided. By a ſmall remark they might ſerve alſo to our vulgar *Engliſh* uſe, but the Roman is leſs. And when I read in *Greaves*, what tickliſh ſcales he carried about him in his travels, I may juſtly aſk, how well you are provided in *Greſham*.

SIR, I have been buſy to fill up my paper, but make too much waſte of your time, and am always,

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

Of ſprings, fountains, lakes, waters, &c. Their originals, Jan. 18, 1663.

OUR ſchool philoſophers do take ſome pains in their philoſophical manner, to diſpute out the original of ſprings. Some ſay, they are engendered in the concavities of the earth, by condenſing air into water. I doubt we ſhould complain of thirſt, if we had no other ſprings. Others pretend to holy evidence, that all rivers come from the ſea, as the main fountain head. To ſalve this we may confeſs, that ſuch rivers, though they come not by ſprings immediately from the ſea, yet they may come thence immediately, by the vapours drawn (the greateſt part) thence, which are afterwards poured down in ſhowers and rain, dews, and miſts.

A VERY intelligent and induſtrious friend of mine, who dwells on the ſide of *Mendipp-hills*, hath made ſuch careful ſearch into the cauſe of ſprings, as by particulars inclines him to believe, that moſt ſprings are begotten by the falling rains, and ſnow diſſolved. For he obſerves in the parts about his habitation, *viz. Mendipp-hills*, *Wells*, *Bath*, &c. which are a fair proſpect for this enquiry, as followeth.

THAT there are certain porous and ſpungy places, which there the people do call *ſwallows*, which devour all the rain, which by rain or otherwiſe is brought from thoſe vaſt hills thither, He notes ſuch ſwallows, as do devour vaſt quantities of rain in the wetteſt ſummers, autumns, winters, and ſprings.

AND that theſe ſwallows and gulfs are oftneſt ſeen on hills and mountains, which are rocky, and where ſhowers are moſt frequent, and ſnow moſt abounding; and where the confluence of rain water ſliding from the tops of the hills is greateſt.

THAT the largeſt of our ſprings are found in the ſides or near the foot of thoſe hills; whereas (ſaith he) in our marſhes, and great levels, it is hard to find a ſpring, the land of thoſe lower grounds being more cloſe, or clay, or mud, ſuch as is ſome way or other leſs penetrable. He noteth a place on the top of *Mendipp-hills*, called *Rough* pits, now famous by Mr. *Buſhell*'s late act of parliament, where the old wrought mines of many fathoms deep ſtand full to the brim after great rains, containing a little ſea, or great lakes of waters. From the foot of one ſide of theſe hills ariſe thoſe noble ſprings, denominating the place an Amnery, and the adjoining city Wells.

HE addeth, that many other ſprings ariſing on the ſides of ſeveral of thoſe *Mendipp-hills* do depend on the ſucceſs of the ſeaſon, growing dry by the heat of ſummer, and flowing again with the floods of winter.

HE noteth ſome ſprings, which are yearly exhauſted in May or June; ſome, that hold out longer as the ſtock of water is greater.

THAT he knows a ſpring, which for twenty or thirty years conſtantly grew dry by Midſummer; yet the ſame ſpring in an extraordinary wet ſummer ran freſh the whole year round.

THAT the ſame ſpring hath been dried up in May, yet the ſame ſummer, after much rain, it guſhed out again before St. *James*'s tide.

THAT he knew another ſpring yielding a plentiful rivulet of excellent waters, which held out ſome moiſt years, but failed in ordinary ſummers.

THAT into the mouth of this ſpring, when empty, he did let in a neighbouring current, which entered in at the ſame place, where the former waters iſſued, and were there devoured for twenty four hours together: that longer time he could not well allow for the experiment, without injury to thoſe, which did partake of the benefit of the current.

HE addeth, that in *Wiltſhire* bourns, he noted pure cryſtalline ſtreams running in gravelly

velly channels between the green banks, where not a drop was to be ſeen in ſummer time; that after a dry autumn, and the like winter ſucceeding, no water was there to be found the whole year.

THAT ſome ſprings, which in forty years and more have not failed, in extreme dry ſummers have failed, as the living have ſeen for one proof, and have heard the like of former days.

HE inſiſteth on the reaſon rendered, why the river cleareth was dried up, 1 *Kings* xvii. 7. "becauſe there had been no rain in the "land." And the Pſalmiſt recounts it to the praiſe of God's wiſdom and goodneſs, that he ſendeth the ſprings into the vallies, which run amongſt the hills, and watereth the hills from his chambers.

THUS far he, a perſon of unqueſtionable credit in what he offers upon his own obſervation. Chiefly I remark two of his notes,

FIRST, that he noteth rain and ſnow to fall more frequently and abundantly on hills.

SECONDLY, that the ſurface and land is in ſome places, and frequently about hills, more bibulous than in the vales, where clay abounds.

FOR the firſt of theſe, I have ſo often met with rain upon *Mendipp-hills*, that I aſked this gentleman, whether he ever ſaw a fair day, or clear ſun, in his neighbourhood. And in *Herefordſhire*, we do generally ſee a white cap of ſnow upon *Malverne-hills*, which are eaſtward, and moſt aſſuredly upon the black mountain, which is weſtward from us, above a fortnight before we have ſnow in our lower ground: and the like I obſerved on the Auvernian, Alpine, and Pyrenæan mountains: and all along our road, between *Lyons* and *Geneva*, I could ſee thick miſts ariſing from the hills, or deſcending on the hills, when in our vale we had a ſettled ſerenity.

FOR the ſecond, we all know the ſurface of ſome provinces to be of a ſpungeous and thirſty ſoil, ſuddenly drinking up all the rains which fall; ſo that after many days of great rain, in an hour's ſerenity, the ways will be dried for pleaſant walks. In other clay land, the water ſinks not, but beats the ſurface into dirt, and haſtens to ditches, lakes, ponds and rivers.

IN a thirſty ſoil, a friend ſhewed me a garden he had deſigned, which looked like a deep broad trench, flanking on the ſide of his houſe. I aſked him, how he could hinder, but that it would be a mote, or fiſh-pool, having no fall or deſcent for the water which came thither: he told me, (and the rain fell abundantly then to prove it) that the ground would drink it up as faſt as it could fall from heaven, and from the leads of his large buildings.

I HAVE ſearched for ſprings near the foot of a hill, and on the deſcending ſides, with good ſucceſs; but I never ſaw a good ſpring, which did not iſſue through ſome gravelly vein, or ſtony vein, which ſometimes would be ſo ſoft, as to fall and crumble away at the touch: and wherever I found this crumbly ſtone, the ſpring would gather a quick ſtream, within a foot or two under it. And thus *Blith* notes in his Obſervations on bogs in *Warwickſhire* and *Leiceſterſhire*, viz. "That "the water, which is ſpued up out of all "bogs, and begetteth the bog, proceedeth "from this interruption of the gravelly con-"duct; and the bog is cured by opening "the ſpring in higher ground; and, that "the ſpring runneth about a foot under the "gravel or ſand."

AND that the earth is in ſome places ſo tubulous, as to ſwallow great rivers, our eyes have been witneſſes; and the noble and induſtrious virtuoſo, Mr. *Greaves*, in his Diſcourſe of Pyramids, pag. 101, 102, collects, "That the earth is ſo tubulous, as to give "ſecret commerce, and free paſſage, be-"tween the Euxine, Caſpian, and Mediter-"ranean ſeas."

AND as the ſurface of ſome ſoil and mountains are bibulous, ſo we may well gueſs, that the channels of rivers, and the bottom of the ſeas, are in many places voraginous, and do ſend waters through channels and iſſues, even to the tops of our mountains, as it may fall out, without any real aſcent, by the diſtance in the horizon.

As why may not the famous ſource, not far from *Orleans* in *France*, as well derive from ſome gravelly or ſtony veins, that are in the channel of the *Loire*, as from the fall of rains on the neighbouring mountains or plains? And poſſibly there is a circulation of waters in this terreſtrial globe, as of blood in animals.

WE ſee, that as fiſh do live in the waters, (ſalt and freſh) ſo do many animals live in the earth, or under ground; not only worms and ſerpents, toads, frogs and effs, but an innumerable hoſt of creepers, whereof ſome are ſo ſwift, and ſome ſo beautiful, their heads trimmed with ſuch rich attire, and their ſkins painted with ſo many laces, ſtuds and guiſes of divers kinds, ſhining very bright as the microſcope, ſhews them, as if they were adorned for ſome light there: of theſe I have found cluſters a foot deep in the earth, having ſtore of feet, and hard bodies half an inch long, driving ſpeedily through the earth every way, and the attire of their heads ſeemed to make room for their breathing. If the earth be ſo pervious for animals, it may alſo give way to dews and moiſture.

BUT the original of ſprings is not ſo much worth our enquiry, as the art and ſkill in opening, finding, and diſcovering them: and he, that diſcovereth a good ſpring, obligeth poſterity; for waters, which do much hurt under ground, do oft-times much good above ground.

BLITH, in his Cure of Bogs, which are many times deſtructive to travellers and cattle, and the worſt waſte of lands, aſſures, upon his experience, "That every bog hath "moſt certainly a living ſpring in it. That "if poſſibly we could light on the head of "that ſpring, or meet it higher, than the "place of the bog, and give it a clear paſ-"ſage, the nether bogs will all vaniſh: that

"wherever

" wherever the ſpring is drained to the bot-
" tom, the bog is cured; but ſhould be drain-
" ed one foot deeper than the bottom of the
" ſpring. That in boggy land the ſpring ly-
" eth deeper than in ordinary ruſhy land.
" That the ſpring is ſometimes within two
" foot of the natural ground, uſually three or
" four feet deep; ſome ſix, eight or nine
" feet deep." And for thoſe countries, he deſcribes the ſeveral lays of earth thus: " Firſt
" he finds a black earth two or three feet
" thick, then to a white earth like lime, and
" then to a gravel or ſand, in which is the
" ſpring."

THESE colours of earth are not for all countries a fixed rule; the beſt help may be from the boring inſtrument, by which they ſearch for marle, coal and ſtone: and a ſoft ſtone or gravelly vein (as I noted before) ſeldom fails of a clear ſpring; and many circumſtances of hills, ſoil, gally or uliginous grounds, may direct our ſearch for a ſpring; and where one is found, it may direct our trial for more, till they be brought to a conſiderable head, or profitable ſtream.

MY foreſaid *Mendip* friend complains,
" That although his neighbours in the
" marſhes and lower grounds have oft times
" too much water; yet many times they
" have too little of that which is wholeſom,
" freſh ſprings being rarely found with
" them; ſo as they and their beaſts drink
" out of the ditches: and if a man hath but
" a hole or a pit to himſelf and his family,
" this he accounts a peculiar felicity, and this
" he forms into a reverſed pyramid, with
" ſteps down into it, as the water ſinketh
" with the increaſing heat of the year. In
" every dry year he caſteth out the mud and
" corruption, and then thinks all is well."
Hence he collecteth the ground of their frequent unhealthfulneſs; and others are as ill ſatisfied with their booriſh and inhumane conditions, as too agreeable to their ſordid liquors. If their lazineſs would endure to dig deeper in ſummer-time for true ſprings, and to bring ſtone to wall them, they might have purer waters, more health, and better minds and manners.

HE noteth, " That ſometimes freſh ſprings
" break out on the very banks of the ſalt
" ſeas; and freſh fountains iſſuing below the
" flux of thoſe ſalt waters: that he meaneth
" not the percolated waters, which are found
" in the ſand digged on the ſhore, mention-
" ed by lord *Bacon*, experiment firſt, ap-
" pears by the inſtance of that famous hot
" well near *Briſtol*, flowing freely from St.
" *Vincent*'s rock, which hath (ſaith he) the
" mouth frequently ſtopt with the tide, un-
" der which it ſometimes lyes ſmothered
" ſome fathoms deep."

HE propoſeth, " That many ſtreams of
" water, which do annoy highways, and mo-
" leſt and endanger habitations, may by eaſy
" labour be diverted into ſuch ſwallowing
" grounds, or conducted to profitable uſes,
" to the help of many noble manſions, which
" want water, and to fit many places for
" commodious habitations: and truly (ſaith
" he) a ſtudious and heedful obſerver, by
" taking notice of the poſition of rocks, and
" the opening of them (which the miners
" there call rakes) may ground a good con-
" jecture, which way waters may be beſt di-
" rected. It ſeems the neighbours and mi-
" ners of *Mendip* have a happy gueſs at it."

BUT now the properties of water in ſprings, lakes, and rivers, is more worthy our conſideration; but the qualities are ſo different, and ſo innumerable, that we know not where to begin, nor how to end, if we intended to embark in theſe ſeas.

FIRST, I will note the ruſtical uſe; and I think, there is ſcarce any water ſo hungry, but if it were at fit times conveyed upon very dry and thirſty paſture, it would improve it. Neither have I ſeen any water ſo rich, but it would impoveriſh the paſture, and ſeem to eat it into holes, and beget ruſhes, and moſs too, if it ſtayed long on the paſture. And I have ſeen the ſame water enrich dry grounds by running at ſome allowed times over it, and impoveriſh the lower grounds, where it lay, till the ſpring ſun dried it up.

YET we note, that ſome uliginous water breeds a coarſe graſs, which cattle will not eat for pleaſure, for feeding, or for the dairy: a goat, upon a bald and rocky hill, will yield more and better milk, than a good cow in ſuch paſture.

AND the water, which deſcends, or paſſeth through the land, that bears the beſt lime-ſtone, or through the rich vale, is pregnant of the clover, which yields milk and honey.

IN cold ruſhy land, a hungry water is found beneath the firſt and ſecond lay of the earth. If the ruſhes be ſhort and ſmall, the water is more jejune.

THEN commonly ſucceedeth a lay of gravel, or ſtony gritty earth, in which this hungry water is.

SOMETIMES this water and gravel is ſo near the turf, or ſward, that the turf and graſs is thereby deprived of ſucculent earth to feed the roots with ſtrength enough for honeyſuckle or other fattening graſs.

BOTH in this caſe, and to cure the forementioned ruſhy land, it is good to order a ſufficient ſtore of trenches to carry away this deceiving water, at leaſt, as often as need requireth; and to ſhred earth thinly on the paſtures.

SOME do affirm, that if the trenches be ſunk a foot or more below the gravel, the water, which lying on the top of the gravel, did impoveriſh the paſture, will in the lower trenches carry a very fertile ſtream. If this be certain, it is an encouragement to ſome improvements, that are not yet in much uſe amongſt us.

WHERE the grounds do lie ſo, as will coſt too much to ſink channels deep enough to carry away this water, in the lowermoſt ground we may ſearch for ſome of the forementioned ſwallows; and that oft-times falls out after two or three ſpade depth under this gravelly ſurface: or it may be improved for fiſhponds, or a watering place for cattle.

To make ſheep-paſture ſafe, it is very neceſſary to draw away this water, which makes the graſs very deſtructive to ſheep.

AND the water, which lyes commonly in the furrows of fields newly turned from arable to paſture, begets a rank graſs very hurtful to ſheep.

IT is ſome ſuch gravelly or ſandy vein as aforeſaid, which carries that uliginous water too near the roots of corn, and weakens it (as the paleneſs of the blades and ſmall return ſhews) for many acres together, in many parts of the richeſt vales. The cure is difficult, and can hardly be done otherwiſe, than by a happy collection of thoſe waters in ſome over-ground, and reſtraining or diverting them from that lay of gravel.

I SAW a field, which in moſt moiſt ſummers, or very wet winters, deceived the huſbandman. I gueſſed, that the waters were detained too near the roots of the corn, and by examining it with a ſpade, I found within a ſpade's depth a ſtiff clay, through which no rain could paſs. In this caſe, it is good in the loweſt ground to make catch-pools, as they call them, which gather the rain waters, and earth with them, to repair the land. And my Mendip friend acquaints me of a witty neighbour, who uſeth an iron inſtrument to ſtrike holes through this clay vein, by which the rain is ſwallowed, and the corn ſaved.

I SHOULD now proceed in recounting the oeconomical, artificial, medical, chirurgical, and various, innumerable, and wonderful qualities of ſeveral kinds of waters. But it is better to inſiſt upon the general properties of obvious waters, to find out the cauſe of their differences; and, by teſt, to diſcover their originals, or the veins, by which they are conducted, which (poſſibly) may be the beſt or moſt frugal way of tapping the iſſues of rocks, hills, and mountains, to find out the ſubterraneous riches.

FOR example, our Mendip friend collecteth, that generally ſprings run in veins not far from the ſurface of the earth, and do rarely pierce ſo deep, as to the copious mineral veins: of all, that fall within his obſervation, he only excepteth Mr. *Buſhel*'s mines and rough pits, which lye wholly in water: that the body of the lower and beſt ſorts of coals do lye wholly drenched in water, which, ſaith he, may perhaps yield ſome ſulphurous qualities, richer coal participating much of ſulphur. By theſe waters, if their peculiar qualities were known, we might examine, whether the Bath waters had not ſome mixture of other more dangerous mineral veins, than our known lead-mines, as *Jordan* ſuſpected.

ALSO in *Mendip* there are ſome caverns of water ſo ſhallow, that in all ſeaſons of the year they can drain them to proceed in their work: others are ſo deep, they cannot drain them, but at peculiar ſeaſons. Here we might try, whether the deeper or the ſhallower were the more ſalubrious for human diet.

OUR well-water, though cleanſed and kept quick by deſcent from a running ſpring, yet refuſeth to diſſolve peaſe for peaſe-porridge; as alſo it corrupteth fleſh in boiling; which the next neighbouring ſprings, which have not that reſt in wells, performeth moſt agreeably.

IN this our ignorance, and want of utenſils, we can better make enquiries, how to diſtinguiſh rain waters newly fallen, from ſuch as have ſtood long, either inſoluted, in clear gravel, pebble, or marble, or in pits and wells, *&c.* than other poſitives. And poſſibly ſomething more of the natures of colours might be found in examining the *Coventry* blue waters, and the *Stroud* ſcarlet waters, *&c.* how diſtinguiſhed.

AT *Wooby vale*, the petrifying waters ſeem to guſh from hard rocks: our ruſty well-water, laſt mentioned, doth in one night give ſtones a reſemblance of ruſt.

I AM yet at a loſs, if in the body of mercury there be not ſome intumeſcence beſides gravity, occaſioned by the outward air, of which I cannot reach the cauſe, but do ſtill wiſh it compared with the natural ſtandard of water. For it calls to my mind two ſtrange notes in Sir *H. Blount's Levant*, near the beginning, pag. 9; firſt, "That at mid-day, "and midnight, the ſtream runs ſlower by "much than at other times." Secondly, "That for ſixty miles the ſtream in the ſame "channel mingles not." May we not find out theſe and many other ſtrange phænomena? But I muſt be abrupt.

Jan. 21, 1663.

Honourable Sir,

IN two or three late packets by Mr. *Oldenburg*'s conveyance, I have moleſted you more with enquiries than with experiments; though pretending to the watery element, than which nothing more vulgar, nor ſcarce any thing leſs underſtood, or more uſeful, or more excellent, ἄριστον γὰρ ὕδωρ. In theſe I preſent a medical ſecret, as it is recommended to me by a perſon of very great wit, and great fame, and long experience in chirurgery, who tells me (and it is evidently true) that he hath by this, as his chief myſtery, theſe eighteen years gotten above 50 *l.* yearly. If it be a ſecret and conſiderable, he hath given me power by your hand to make it my affectionate offering to the Royal Society. But confines it to you and the other ſworn perſons of the council for uſe; and that his myſtery in the nakedneſs of compoſition, and application, be not proſtituted. If it be vulgar, and trivial, you well pleaſe to let me know ſo much, that I may underſtand the meaſure of my obligation. It is no more than this.

TAKE half an ounce of coloquintida (pulling out the ſeeds carefully) boil it in a quart of wine vinegar, till a third part, or thereabout, be conſumed. Strain it, and then boil it up a ſhort wain with a pound of the beſt true ſugar, that is not mingled with alum, *&c.* ſcumming it. In bottles it will hold

good

good ſome years. It kills infallibly all manner of worms, and may be ſafely taken in potion, a ſpoonful for a child of two years old; two ſpoonfuls for eight years old; four or five ſpoonfuls for firm age. If a gliſter or vomit faileth to work, this in a ſpoonful or two never faileth, nor forceth the ſtomach, as the vomit doth; and cleanſeth the bowels of all ſorts of worms, wind, *&c.* cureth cold, agues, *&c.* It ſhould be taken faſting, and to faſt two hours after, with care from cold. It is dangerous to drink cold drink within ſome hours after. Drink well warmed with a toaſt may be taken after two or three hours. The gentleman being famous, and of much practice in the chief parts about *London*, *Barkſhire*, *Bucks*, *Wilts*, *Oxford*, and now in the Weſt, aſſures me, that ſeveral kinds of worms beget unknown maladies, and are very generally the deſtruction of young and old, breeding in all parts of the body, in the womb and ſeed veſſels, and are cured by this in a ſyringe, in the eyes, brain, *&c.* of which he promiſeth me the account and application. He ſhewed me ſome ſtrange monſters, which he brought alive from his patients. Here (at Mr. *Phelip Mountague*'s) a woman voided a monſter of twenty one inches long, and full of joints like knot-canes, or horſe-tail graſs. The head ſome of the family had cut off, and caſt away, ſo that we could not ſee it. This they did, becauſe it was ſo ugly, as might raiſe ill fame. Some ſaid it was like a ſerpent. The toſte is much diſguiſed by the vinegar and ſugar, yet ſo horrid, that ſome chew cheeſe, and ſpit it out, ſome other things to remove the diſguſt. Some bodies breed deſtroying worms perpetually: theſe muſt uſe it twice, or more often in a year. How trite ſoever it may ſeem to you, be pleaſed to try a doſe of it upon a pot of garden-worms, and obſerve it with your own eye, with what ſpeed, and in what manner it operates upon the worms. It will invite you to ſhew the experiment to the Royal Society. They may gueſs at the ingredient, but miſtake the mixture, doſe, applications, and effects. He tells me of worms of incredible length found in the bowels; and finds often worms, that do fill up the whole length of the ſmall guts in rabbits. I have deſired a kinſman (my couſin *Phelip*'s ſon) to attend the ſlaughter-houſe of butchers to ſee, whether worms may not be found in the bowels of tainted ſheep; for they and rabbits are ſubject to the ſame ſeaſons of the rot.

I HAVE read in phyſicians old and new, that human bodies have produced ſome varieties of the ſubterraneous matters, vegetables, and animals. And our liquids are a pregnant mother almoſt of all things. My old lady *Phelips* is a conſtant water-drinker, and it hath preſerved her (as ſhe conceives) from a reſort of feverous heats in her ſtomach, and from the ſcorbutic, which ſeized upon her about forty years ago, when her huſband Sir *Robert Phelips* was committed to the *Tower*. She is pleaſed to try the diverſities of many waters (which I name to her) by the taſte of her palate. Some years ago I ſent to Mr. *Brereton* a ſhining ſand, that ſeemed like ore of tin or ſilver, full of ſuch thin ſparkles. The refiners made nothing of it. But the water cleared the eyes, healed ſcabs and itch, diſpatched ſun-burning and freckles, and gave ladies a luſtre as quick as any of their new pigments. By this vein of ſilver-ſand, I was directed to open many permanent ſprings thereabout. And in my garden I had a black poiſonous moat, which infected all the houſe in hot weather, and bred toads and efts, which deſtroyed my garden. I digged a trench, and found a fall to convey away thoſe foul waters, and then found a weak ſpring, which by ſinking it two foot deeper, diſcovered that vein, and continued a very briſk and wholeſom ſpring of the foreſaid qualities. By which I concluded it beſt to avoid the depth of fountains, or wideneſs of moats, by which the water might contract putrefaction by reſt. And in thoſe beautifying fountains, I allowed but a ſhallow and narrow compaſs for the reception of ſpring-water.

MY friend of *Mendip* tells me of a black incruſtated ſubſtance, which he found in *Mendip-hills*, bedecked very delightfully with artificial branches of the exact form of ferns, which they there ſay is an infallible diſcoverer of a coal-mine; and that there are the like forms of bay branches. And that Mr. *Buſhel* (to whom he gave this reſemblance of fern) ſhewed him the like reſemblance of roſemary ſprigs, which he found in the veins of ſilver. The ſtones of ſerpentine figures, which I preſented by Mr. *Oldenburg*, are in the very ſame ſhape of two colours, thoſe of *Keinſham* near *Mendip* are reddiſh, as I hear the ſtones are there: theſe about *Hambden-hill* are yellow, as the *Hambden* ſtone is. Monſieur *Petit*, a medical practioner voucheth his own frequent experience, that their powder in drink is a moſt incomparable antidote and preſent remedy againſt poiſon. I am ſlow in my faith. Here are of the ſame in divers other ſtrange ſhapes, ſcalops, rams-horns, and as the marks of feet of beaſts and birds, as if imprinted in breeding there. This I ſee, and of this I can further aſſure you, that both here, and at *Keinſham*, ſome ſtones have been cleft, containing about ſixty of theſe ſerpentine ſhapes, ſome bigger and ſome leſſer, as in cafes. And one is ſent me moſt curiouſly drawn, but (as all the reſt) without a head. The materials very hard and weighty, and in all appearances reſembling metal between a ferruginous and copper colour. It ſeems a kind of marcaſite. This I had from *Keinſham* near *Mendip*.

SIR, I ſhall conclude this with a very ſtrange ſtory tranſcribed verbatim from the ſame gentleman, a perſon of undubitable credit. I ſhall impart a paſſage near me, from whence you may extract ſome profitable concluſions in philoſophy. My neighbour's ſpaniel worrying a ſheep, they fell both together into an old mine, and faſted there a full fortnight. At length the owner of the ſheep directed to the place, drew out his beaſt alive; but the

dog looking with glowing eyes in the dark pit, and not meriting the diſpleaſed man's courteſy, was left there alone for a full week longer, and at laſt being relieved, lives to put you upon the ſearch of this ſecret. This was a pit, where the air was ſerene, neither too much, nor too little. But in mines, where there is a quick ſucceſſion of air, the ſtomach is craving. The dog lay cloſe to his prey, yet faſted. Thus he, March 12, 1662. by which date I gueſs it was in that winter, or near that time.

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

Yeovill, April 25, 1664.

Honourable Sir,

I RECEIVED, by our dear friend Mr. *Oldenburg*'s conveyance, the Hiſtory of Colours from your noble and bountiful hand. I muſt keep conſtant to your order of forbearing the juſt applauſe due to you. And therefore I will rather complain, that in this you have inflamed our deſires, and expectations to ſee the deſign completed by the ſame happy hand, at leaſt for the remaining ſimple colours, yellow, red, and blue. For if you reſt here, I do not think any diſcreet man dares attempt to go on. And in my opinion, you have not only broken the ice, but have abſolved the main and hardeſt work already. For, in mine own narrow thoughts, I was moſt of all plunged at the cauſes, and difference of whiteneſs and blackneſs. All that I can ſay to this excellent work I have ſignified already to Mr. *Oldenburg*; and it importeth nothing but votes for the like ſucceſs in the reſt.

IN the firſt place, I wiſh there were prepared to your hand (by ſome judicious and induſtrious perſon, who throughly taſtes theſe your pleaſing diſcoveries) an acute, full and pertinent collection of God's paintings (ſo I may juſtly call it) on flowers, and fruits, and other things in nature, with the adjunct alterations in taſte, medicine, or other qualities. For ſome flowers admit of ſome variety, others of more or leſs. Some flowers, and many ſorts of fruit do change complexion, as they advance in maturity. Of which ſome judgment is given by my lord *Bacon*, and contraverted by Mr. *Auſten*. I have ſeen a very ſmall and almoſt inviſible touch of red, or purple, as the ſun and heat encreaſed, in one day ſpread all over a tulip, which in the morning appeared white. And I have ſeen thoſe you call blue-bottles take the ſame beauty in other colours, white, pink-colour, ſcarlet. And I can name but one garden, where I found this weed in this variety. But this I cannot wiſh, without hopes of your notes, method, and illuſtrations upon it.

MY ſecond wiſh is, that you would take up a whole chapter in the uſe of your microſcope, or rather of three or four more and leſs magnifying glaſſes. For though my eyes were never good, and are now much decayed, and my beſt magnifying glaſs be not worthy of *Reeves*'s promiſes; yet by mine, and ſome other leſſer microſcopes compared together, I ſeem to receive many hints, and much aid towards the diſcovery of the original of colours, at leaſt in many particulars. In mine I can, with my bad eyes, find the different conſiſtence, cloſeneſs or looſeneſs of contextures, which cauſeth the ſame colours in ſome bodies to be more lanquid and duſkiſh, in others more briſk and vivid, in others more emphatical. I can ſee ſome of thoſe ſimple colours compound, ſome duſky, thick, and dark bodies tranſparent, *&c.* For example, I have not ſeen more changeable variety in any flower, than in the leaves of one ſort of ſage, as chamletted with whites, greens, reds, tawnies, purples, yet all in a duſky hue; and the gloſſes will ſhew the porous and ſpungeous windings, which mortify the rays from a briſk reflection. Here in the great glaſs a very perfect vermilion had very little true redneſs, but only a ruddineſs, as of thick gore-blood, and ſome ſparkling corpuſcles, whoſe ſtrait and direct ray ſeemed to give the bright redneſs on the way. So in greens, and other colours, I find them leſs perfect in the glaſs, but compounded of ſhining ſparkles from other parts of the ſame leaf. And every perfect painter knows, that his picture would lie flat on the table, and be worthy to lie in the dirt, if it were not taught by the artifice of ſhadows to come off roundly. A very dark grey ſand is here all cryſtal and tranſparent. Some other ſand, of no alluring colour, is rubies, emeralds, every jewel, not one ſand of dull hue. I pounded the black ſhining ſand, and it was full of ſtarry eyes. I filed off ſome ore I had out of a tin mine, which ſeemed to the naked eye very luſtrous, but the very ſmall duſt denied in my glaſs to be luſtrous or tranſparent. Here I ſee ſome reaſons of the differing briſkneſs of colours in metals, glaſs, horn, ſilk, woollen, linen, flowers, *&c.* and much that may confirm your main engagement.

SIR, I will adventure to betray the folly of a third wiſh, which may ſeem very phantaſtical, but it had this occaſion or temptation. Mr. *Oldenburg* beſtowed on me a hydroſtatic, which being fitted to a horn, that gave no more room than was neceſſary to let the inſtrument ſink, I could thereby, and apparently to mine own defective eye, diſtinguiſh the ſeveral weights of ſpring waters in the tenth or fifteenth part of a pint, more palpably, than I could diſtinguiſh the whole pint of the ſame waters in the beſt copper ſcales, that this town affords. Hence I aſked, how far this inſtrument may be improved? and whether poſſibly it may not diſcover ſome of the liquids, which you mention, after colour to be lighter, or heavier, than either ingredient was. If ſo, it might be a kind of argument of

cloſer or looſer contexture of parts; and thence ſhew (for ought I know) which ſort of colours require the cloſer contexture. If I tried in white wine, and red, or claret, in the juice of white and red raſberries, or white and red currants of the ſame age and degree of ferment refined, I cannot here make ſo exactly the ſame inference, becauſe in that way the very individuals are laid in the ſcales. In wines, and cyder, and perry, and all thoſe liquors of currants, raſberries, and in plumbs, ſtrawberries and cherries, as I apprehend, the red do bind the ſtomach, and tickle it with a more ſalubrious provocation of appetite, and help of digeſtion, than the white. What this will infer for colours I muſt rather expect from you, than offer the ſacrifice of mine own ignorance. Thus I conceive, that the ſtatics may bring in collateral aid to many diſcoveries of heat, and fire, fermentation, cloſeneſs of parts, and many other matters, if not alſo of colours.

BUT with this looſe diſcourſe I have ill requited you for your great favour. Yet if I could make better returns, they ſhould not be wanting.

Honourable Sir,

I muſt ever remain

your moſt humble and

moſt obliged ſervant,

JOHN BEAL.

May 27, 1665.

SIR,

IT was Thurſday laſt that I received your noble favour by the conveyance of our worthy friend Mr. *Oldenburg*. I am not worthy to offer you any account of it, and leaſt of all, being now in the prime of the enjoyment. This argument of cold I had only *in votis* about eight years ago, and ſo I wrote to Mr. *Hartlib*. But I had no hope then to live to ſee the beſt of chemiſts ſummon all the curious, to have a due regard to ice, and ſnow, and freezing. I had at the ſame time a like deſire for a conſiderable micrography. And I know, to whom we are indebted for that performance alſo. In truth I am in many other matters of greateſt weight prevented; and am ſurpriſed with illuſtrations far above the maturity (I ſhould ſay the rawneſs) of my wiſhes. And you have done much to teach us all, how to rectify and to amplify our aims, wiſhes, and enquiries.

I AM full of deſires to prove my ſelf no unthankful perſon, having received ſo many great favours from you; and every ſmall river returns to the ocean, as the ſovereign of all ſprings. I can only offer effete endeavours. I have often been ſolicitous, how I might tender to you one line, that might be ſerviceable to your dear engagement for the empire of mankind. That which herewith I ſend you, is my laſt thoughts, but ſo raſhly drawn, and in ſuch an unlegible hand, that I cannot deviſe, how you ſhould find a reader, or one, that can have the patience to ſever the few grains from the maſs of droſſy ore. If I ſhould keep them for a review, the whole would be forfeited under the ſpunge, as hath befallen me in other eſſays of more affections than judgment. Neither have I hope of leiſure for ſecond thoughts. You will here allow rather the warmth of a ſolicitation, than require the rigour of experiments. Yet I had not been ſo forward in this, if I had not in my ſelf in my childhood, about five or ſix years before I came to *Eton* ſchool, found more of truth in what I here propoſe, than I hold fit to affirm now, or to expreſs. I aſſure you, I did abide oft-times under water with much wonder at mine own eaſe, and delight in it; and ſo long, that in my preſent underſtanding, and with ſuch memory, as I have of it, I cannot think it poſſible, that I ſhould or could abide half ſo long without breathing above water. And this I take to be a conſiderable query, whether the Americans and other naked people, which are bred to ſeek their food in the ſeas, and to take much of their habitation there, are not able to dive longer than they can hold their breath above water; chiefly whether their children are not more apt to ſwim, or to endure diving at the firſt eſſay, much better than we that are cloathed, and dry fed.

SIR, I think you may find yourſelf there recited in a parentheſis, that takes in more than I intended, or agrees with ſtrict truth; but I thought it fit to paſs in the number of other known faults, becauſe it falls into your merciful hands.

BUT I defraud you of that, which you can hardly ſpare, your precious time.

I PRAY for the right honourable vicounteſs *Ranelagh*, and for all your excellent relations.

Moſt Honoured Sir,

your moſt obliged ſervant,

J. BEAL.

Yeovill, Sept. 7, 1665.

SIR,

I WISH theſe may find you in *Eton* college, and well ſettled there. But I am alſo to acquaint you, that by poſt, on Monday laſt, I ſent to Mr. *Oldenburg* two conſiderable accounts of Mr. *Gratrix*'s healing.

THE one is in the hand of Mr. *Thomas Wall*, a miniſter (independent) who, it ſeems, took a journey from hence thither, with ſpecial purpoſe to be throughly informed of the whole truth. He noteth many peculiars, which deſerve and require at leaſt a double teſtimony, eſpecially that of the healer's hand twice ſtruck dead, and black as a coal, upon his unbelief, and as often healed by the touch of his other hand. If this can have no other witneſſes but Mr. *Gratrix* and his wife, yet

then the conſtancy and agreement of their teſtimonies are fit to be recorded.

THE other account is from *Lionel Beacher*, ſometime mayor of *Biddiford*, who could take no ſatisfaction, but from his own eyes and ears. This is ſaid to be in Mr. *Worſley*'s hand, and it is very like his hand. I received both from Dr. *Sydenham*, who preſents his humbleſt ſervice to you. He promiſeth to overwhelm us with clear evidences of ſuch wonders, as would be incredible, if not ſo well confirmed. And I have ſeen many other good teſtimonials of like wonder.

SIR, if you ſhall pleaſe to examine theſe accounts, perchance you will perceive many things worthy the ſagacity of your own further enquiries and directions; and your acquaintance in *Youghall*, *Liſmore*, *&c.* may give you large opportunities to add to the ſearch and evidence of a buſineſs, which deſerves to be ſpeedily publiſhed, as far as is poſſible, and with fulneſs and exactneſs. It is a convincing evidence of the powerful name of our Lord *Jeſus*, in a ſeaſon, that needed ſome evidence, that all revelations were not fanatical.

BUT I ſhould refer all to your own better advice, being always,

Honourable Sir,

your moſt obliged and

faithful ſervant,

JOHN BEAL.

October 11, 1665.

SIR,

I MADE as much haſte as I could to return my moſt humble acknowledgments of your laſt favours by the ſame hand, that brought them to me.

BUT now hearing, that you give life to the engagements of the Royal Society by a club in *Oxford*, and that you have opportunities to confer with Mr. *Auſten*, I make bold to propoſe an expedient or two, by which his induſtry and faithfulneſs to experiments may correct and amend old reports, and much improve our vegetables for aliment. Much of this I can give in one reference, *viz.* to *Palladius*, and more particularly his fourteenth book *de inſitione*. Where, though we muſt expect a poetical gloſs, and overſtraining for wonder, and I have ſeen ſome experiments fail of his character; yet I cannot hear of any ſufficient proſecution of the argument by real and careful eſſays, which may at eaſy rate be made in a nurſery, where the neighbour grafts may be permitted to draw from their native ſtock, more or fewer years, for variety of experiment. I hear of many eſſays of Mr. *Finch* in *Herefordſhire* and *Worceſterſhire*; but not of any ſuch largeneſs in his aim. We ſee, that *Palladius* wrote much upon real experience himſelf, being an illuſtrious perſon of large revenues, his lands in *Italy*, *Naples*, and *Sardinia*, *&c.* very differing ſoils, *&c.* More particularly, and of more general uſefulneſs, and at ſome certainty, we may complain, that we have too long and too much neglected the liquor of cherries. For it is beyond belief, what ſtore of cherries one acre of kind land will yield in a fit air, when they eſcape froſts. And by this you may judge of their cheapneſs, that we have often ſeen cherries brought from *Peak* near *Worceſterſhire* to *Hereford* (which is eighteen miles) on horſe-back for two pence per pound, or thereabouts. For ſuch carriage they muſt be gathered more carefully, than for the preſs, and the liquor may yield a far greater value; but I could never obtain a due examination of the ſalubrity of the liquor, or what kind of cherry yielded the beſt and wholeſomeſt liquor, how long they ſhould be in the heap, after they are gathered, before they be preſſed; and the time of the liquor's maturity. I was in covenant with many perſons to proſecute theſe enquiries, and to deviſe commodious preſſes; and ſome applauded their ſucceſs, ſome failed, none took encouragement to continue the experiment, and to advance it to any conſiderable quantity. And it is to be conſidered, that ſome land and air is fitter for cherries, than for other fruit. And perchance, they would do leſs hurt in liquor, than in their kind: otherwiſe I would ſay little for them. I conceive they ſhould be preſt within twenty four hours after they are gathered; yet not immediately; and the liquor ſpeedily encloſed for fermentation. For it ſeems apt to expire.

BUT, Sir, I ſhould not give you this trouble, neither do I intend it otherwiſe than by your recommends with my ſervice to Mr. *Auſten*. I have indeed many other thoughts concerning apples, pears, and cyder fruit, but that work thrives happily, and needs no nice curioſity.

FOR the vegetables Dr. *Sydenham* is a very heretick; he detracts as much from the worth of their knowledge, as they overſpoke it, who gave them a Godhead. And *Hortus Sanitatis* is leſs faulty in over-numbering their virtues, than he in diminiſhing the account. He was much pleaſed with the account I offered of the correſpondence of parts in plants. I had my firſt directions in a brief manuſcript from Mr. *Hartlib*, *de herbis ſine duce cognoſcendis*; which I did put into my lord *Brereton*'s hands, intending it for the publick; and I conceive it worthy to be further ſolicited.

SIR, ſince you have appeared ſo heartily and ſucceſsfully for religion, and have once allowed me the freedom to adviſe you in one point, wherein you will pleaſe to remember, that I did not engage them in a controverſy, but only moved you to decline the engagement; I pray you let me further prevail with you to adventure half a quarter of an hour (it cannot coſt you more time) to read the ſecond chapter of *Socinus*'s *Prælections*, *In quo quæritur, quid ſit in homine naturaliter, quod ad religionem pertinet.* It hath been much in my thoughts above theſe thirty years. And it

adverti*ſed*

adverti ſed me to dive into the ſpirits of many people to find their bent, notions and grounds. And as to the general, I find it very hard to diſcern, how much or how little of religion we have in the frame of our natures; and to diſtinguiſh that from all kind of revelation, or tradition. And Mr. *Hales* told me often, that he found himſelf utterly at a loſs in that point. And ſo he notes in one of thoſe ſcraps, that are printed.

YET I incline to conceive, that all the world over there is more of revelation and grace, than we can ſtrictly claim from our natural frame, or any lines written in our hearts. And I hope this will acquit me from Pelagianiſm, which the Calvinians do liberally daſh upon all their adverſaries. And for ought I can hear, the Americans in general take more reverend knowledge of ſuperior and divine powers, than ſome that live amongſt us. And I can ſhew you in *England* the full body of ſome towns and countries, very zealous, devout, ready to do, to ſuffer, and to expend freely in the way of their religion, yet within twenty or thirty miles of that place, the whole body of people habitually, and time out of mind, unſenſible, and wholly as unconcerned in all diſcourſes of religion, and apt to take all to be fanatics, that make any pretence to ſerioufneſs in devotion. Hence I collect, that by cuſtom many people do unconcern themſelves in the holy traditions, which they received from their anceſtors. And yet alſo that all nations very generally, if not univerſally, have ſomewhat of holy tradition; and therefore it is the beſt uſe we can make of our reaſon, if we employ it candidly and heartily to find out ſafe and firm grounds why and how far we ſhould admit of revelation, by what evidence, *&c.* To the words of *Socinus*, *Hoc autem nihil aliud eſt* in arg. 12. of that chapter, I can add the fulneſs of primitive fathers, of beſt authority, which being added to the elegancies of *Cælius Secundus Velcurio*, *de amplitudine regni Dei*, will plead more comfort for good-natured, ſober and honeſt Gentiles, and much more yet for devout Jews and Mahometans, than for our over-growing atheiſtical drolls.

BUT the letter I intended is become a book of blots, and it is time I ſubſcribe,

Moſt honoured Sir,

your moſt obliged ſervant,

J. BEAL.

Nov. 9, 1665.

SIR,

BY the favour of your conveyance, I have received a packet from Mr. *Auſten*, of which I know not how to acknowledge the receipt, but by giving you the trouble of it.

I BELIEVE Mr. *Auſten* hath given you the ſame account, which he does to me; and is very ſolicitous to promote cyder by laws. I hope there is no need of ſuch enforcement. For, I hear that nurſeries of fruit-trees are advanced in every county, and that will alſo prepare, and encourage the preſent, and poſterity. But becauſe nurſeries are ſlow, and the men of this age are impatient for diſpatch, I can propoſe an expedient, that would entertain the curious, and find them an employment in their nurſeries, as hopeful, and as uſeful, and as delightful, as in any kind, either of philoſophy, or of agriculture. I mean the re-examination, and the further proſecution of the noble *Palladius*'s XIVth book, which is *De inſitione*. Of this I made mention in my laſt to Mr. *Auſten*; and now I have doubly recommended it to your own advice. If I had leiſure, I would adventure it in a more publick manner, together with ſome other collections, which I have found in old writers, and compared with modern Eſſays. And I think we may wonder at ourſelves, that we have done ſo little in a field ſo large, upon an argument ſo pleaſant. And I wiſh ſome good printers would take notice, that *Palladius*, and the other three, *Rei Ruſticæ Authores Latini veteres*, will never be out of requeſt, but have this long time been out of print. Dr. *Fell* found it a hard work, and of long time to procure me one of them; and that is in a very faulty edition of *Hier. Comeline*, *Anno* 1595. Mr. *Oldenburg* hath them in the edition of *Robert Steven*. It were no hard work an academical corrector of the preſs, to improve the beſt edition, as by the notes of *Barthius*'s notes in *Columella*, Lib. X. *De cultu hortorum*, *&c.*

AND in my time we were many of us in *Cambridge*, who did freely offer our aſſiſtance to the correctors and printers upon all ſuch occaſions.

BUT, Sir, I muſt crave your pardon for my frequent importunities.

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

Feb. 6, 1665.

SIR,

I MUST remember, that when firſt you beſtowed your books upon me, you blamed me for not returning my cenſure. If I had need of an apology for ſuch freedom as I here intend, hence I could frame it. But your virtue is more ſolid than to require ſmooth handling; and you cannot exchange that leiſure for a compaſs of ſoft words.

1. THEREFORE to begin rudely with generals, I ſhall tell you that, which you will hardly believe. Perſons of no ordinary capacities do find your three diſcourſes of thermometers and baroſcopes difficult; that aſſiduity upon the argument, with exemplars before your eyes, hath made all things ſo eaſy to you, that you will ſcarce apprehend, how

it can be intricate to another. Yet I ſee no remedy you can have to clear all, but by recommending the ſale of all ſorts of weather-glaſſes, and baroſcopes to ſome perſons, that are fitteſt, and of beſt truſt, in *London*, *Oxford*, and *Cambridge*. Theſe are the liquid demonſtrations. And ſome inventions may be better communicated in ſpecie, than by books.

2. I ENGAGE for you, that you need not the poet's excuſe, *Brevis eſſe laboro—Obſcurus fio*. For you are as plain and ample as can be. And whatever is of itſelf intricate, it comes often in your way, and is laid down in variety of good expreſſions. But whilſt you take too much care to ſecure our underſtandings, and to help us with much of your patience, ſuch as have not the objects before their eyes, are more apt to languiſh than to feel the life of your arguments. Were the virtuoſi furniſhed with theſe philoſophical utenſils, then you might permit yourſelf in ſome repetitions to come off more roundly, and more briſkly; and well you might adventure to refer this to your judicious tranſlator. I ſhall explain my ſenſe by an exemplar of a twofold aſpect.

A NUMBER of famous lawyers did urge againſt me, that our learned *Selden* wrote the beſt Latin, that ever was uttered. I denied it to be his due praiſe; for in truth he took too much care to be rightly underſtood, and to bound his own ſenſe: and *Ben Johnſon*, when he read *Seneca*, cried oh, that he would truſt my underſtanding! This was in a far differing caſe, for he meant it of giving the ſame ſum over and over in ſeveral coins. Of the latter fault no man can accuſe you; and for the former excuſe, I do truly thank you, but all men will not turn it into your praiſe.

3. MORE particularly the tranſlator may do well to refer in the margin to the ſcheme or figure there intended; or to explicate where the diſcourſe requires ſome change of figure. As I think, p. 33. which ſeems to belong to the firſt or ſecond, and to the fifth figure, though not beforementioned.

4. AND perchance there is ſome miſtake of the printer, pag. 792. l. 8. where *Zucclius* pretends to a good ſealed weather-glaſs, which if true, removes the ſuſpicion of pag. 797. that it was not a ſealed glaſs. And again there, pag. 792. l. 9. it is ſaid to be obſerved three years together, which excludes the anſwer, p. 799.

5. I SHOULD add, that I am almoſt become confident, that one of my thermometers by ſuch inſolation, as may be had in *England* from our ſtone walls, hath loſt ſome inches of liquor. For I cannot find any leak, or expiration, neither doth it waſte at any other time, but under very ſtrong heats: and a ſmall cylinder of water on the ☿ in my baroſcope, and alſo a white liquor, which in the extremity of laſt winter froſts was diſtilled from the ſpirit of wine into the bolt-head of my ſmalleſt ſealed thermometer ¶ theſe two liquors do remain in the uſual ſolar rays of my ſtudy unconſumed. From whence I ſeem to argue, that ſealed thermometers may fitly be graduated for our winter, and for ordinary ſummers; but for better uſes another thermometer may be appendant, that at ſome ſeaſons it may be compared, how far it agrees with the firſt rules of graduations in the winter thermometer. And if your perfect ſcales will ſhew, that a ſealed glaſs may by inſolation loſe weight, then you may adviſe your tranſlator of a ſhort paragraph, pag. 58. l. 14. For that in ſome caſes, the ſeal will not keep the liquor from evaporation. But who can enumerate all the diſcoveries, that may be made by ſealed glaſſes, as well upon earth, and vegetables, as upon air and liquids?

6. I PRAY you ſuffer me to raiſe a queſtion, which is more like to betray my own ignorance, than to inform you. This I would not preſume to do, if I had any ice or ſnow here. It is above thirty years ſince I practiſed the freezing by ſnow and ſalt. Then I ſeemed to apprehend, that a kind of circular motion of that ſnow and ſalt did accelerate and invigorate the freezing. And this laſt, May 6. I tried the like or more gentle but circular motion of the liquor, in which mackarels were boiled and pickled, for the luciferous experiment of ſhining in the dark, which (though the water or pickle was thick and muddy) ſucceeded without fail, upon the motion of the hand in the ſame gentle circular manner, as the dairy maid ſtirreth the milk, to curdle it for cheeſe. When that motion ceaſed, it did not ſhine. But in this experiment there were many other circumſtances requiſite, of which I can give you a fuller account at your command. This ſeemed to our preſent purpoſe, the reſt to belong more generally to fermentation. If this ſhould have any importance towards freezing, your tranſlator may be minded of it, pag. 181. For though you ſignify near the end of pag. 525. that it ſhould be nimbly ſtirred; and again, pag. 593. l. 1. in a briſk motion: and there again, l. 20. in another kind of agitation. And though the circular motion cannot be applied in many of your experiments, yet if you find it true, or any kind of motion more conducing than other, the firſt rejected place, pag. 181. may be fitteſt for the record; and poſſibly this enquiry, and the microſcope, may ſomewhat aſſiſt for the hypotheſis of cold. If it proves impertinent, I hope you will not impart it to any want of my reſpects. For I offer it with diffidence enough.

THUS I have ſearched for cavils from the beginning to the end; and in the laſt waſte page of *Opera nondum edita*, I find my diſcomfort. For there I miſſed *The Continuation of lord* Bacon's *Sylva Sylvarum*, or *promiſcuous Experiments*, mentioned in your *Phyſiological Eſſays*, pag. 14, 15, and 16. This title might preſerve and ſhelter many ſcattered papers of beſt note, and redeem you from the trouble of methods and ambages, and ſupply and rectify the firſt adventurer, our lord *Bacon*; and would ſuggeſt many occaſions to prove, that ſomebody hath at laſt advanced beyond his expectation and votes: and one well choſen experiment

experiment is (in my opinion) worth more than many of the largeſt volumes of old ſtile.

YET this I durſt not ſay, if I did not think it would rather eaſe you, and free you from ſome confuſions, than add to the burthen. I am ſure I am,

SIR,

Your moſt obliged, and

moſt humble ſervant,

J. BEAL.

SIR, you gave us the firſt or fulleſt notice, that the ſmaller glaſs canes do draw water higher above the ambient ſurface, than wider tubes. And the ſame heat, which fits the bolt-head to draw water into the open weather-glaſs, will not ſuffice to expel the ſame water; and the ſmaller weather-glaſs requires the greater encreaſe of heat to expel the liquor. And the gravity of the atmoſphere hath more influence to interrupt the indications of heat and cold in one kind of open tube, than in another. But you give us good reaſon, why we ſhould not expect, that you ſhould here lay down all your own obſervations. The white liquor, which I noted to be diſtilled out of the ſpirit of wine, deeply tinged in the hardeſt froſts, was done in a very ſmall glaſs, that had the faults, which you mention, pag. 41, 42. In the larger thermometers it did not ſucceed, though they were expoſed longer to the ſame froſts. This may accord with lord *Bacon*'s conjecture in experiment 27. M. H.

Of mackarels, and their liquor ſhining in the dark.

ON Thurſday May 5, 1665, freſh mackarels were boiled in water with ſalt and ſweet herbs in the uſual manner; being boiled, they were taken out of the water, and on Friday morning next following, the water being then perfectly cold, the mackarels were put into it for a preſerving pickle. On the morrow being Saturday, more freſh and ſweet mackarels were boiled in like water, and on Saturday morning were put again into the ſame boiled water, being then fully cooled, and both mackarels and water were then put together in the ſame veſſel with the mackarels and water, that were boiled on Thurſday foregoing.

ON Monday evening the butler ſtirring the water to take out ſome of the mackarels, found the water very luminous, and the fiſh ſhining through the water, as adding much to the light, which the water yielded. I could ſee the fiſhes in their juſt proportion, as they lay, emitting rays all over the water; and both fiſhes and water ſpreading rays at ſome ſmall diſtance about the veſſel.

THE water by the mixture of ſalt and herbs in the boiling, was of itſelf thick and blackiſh, or dark; yet being ſtirred, it ſhined, as having ſome inherent light in itſelf, but the fiſhes appeared more luminous and in their own ſhapes, as is above noted.

I NOTE, that the liquor had ſome inherent light in it apart from the rays of the fiſh; for that, wherever the drops of water fell, they ſhined, both on the ground, and on the ſtools. And my children caught drops in their hands, as big as a penny, or two pence, and theſe drops by ſhining ſeemed to me as broad as ſix-pence, or a ſhilling.

THOUGH neither the fiſh, nor the water ſhined, till the water was ſtirred; yet when it was ſtirred, and ſhined, the drops, that fell, continued to ſhine for ſome time, and the children ran about the houſe ſhewing the drops ſhining in the palms of their hands.

THE butler ſtirred up that ſide of the fiſh, that was loweſt, and thence came no rays of light; but thoſe turned fiſhes appeared black in the ſhining water. And the water, after it was fully ſettled, and at reſt, which was about an hour after, neither it nor the fiſhes lying in it did ſhine at all.

ON Thurſday night we repeated the ſame trial on the ſame fiſhes and liquor, and found the ſame effects. The water gave no light till it was ſtirred, but was thick and muddy, as we ſaw by the foregoing day-light, and then by candle-light; but being gently ſtirred by the hand moving round, as the dairy-maid is uſed to gather the milk into curds for cheeſe, the liquor and fiſhes did all ſhine together.

THE fiſh did then ſhine, as well from the inſide, as from the outſide, and chiefly from the throat, where the inciſion was made to take out garbage, and in ſuch places as were broken in the boiling.

I TOOK a piece, that ſhined moſt, and fitted it to my leſſer microſcopes, and alſo to my great microſcope; but I found no light in any of the glaſſes, nor from any drops of the ſhining water, when applied.

ON Wedneſday I examined thoſe broken pieces in my great microſcope in the brighteſt ſun-ſhine. At firſt we could find nothing very remarkable on the ſurface of the fiſh in any poſture. After we wound the object plate a turn or two below the juſt diſtance, both others and myſelf thought we ſaw a very thin ſteam, rather darkiſh, than luminous, ariſing in the glaſs like a very ſmall duſt, and rarely here and there a very ſmall ſparkle in the fiſh. Of theſe ſparkles I am certain; for we numbered them, and agreed in the number, order, and place of the ſteam. I am not very confident, whether it belongs to our eyes, or imaginations, or to ſome duſt in the air, though it was without doors in the garden, ſo ſmall it was, if it was any thing more than a fancy.

THIS piece of fiſh being fitted to the great microſcope by day-light, was re-examined in the dark of that evening, and it yielded no light at all, either to the view of the glaſs, or otherwiſe: finding it dry, I tried, whether by the mixture of ſpittle, or by rubbing, it would ſhine. And ſo it did a very little,

not in the glaſs, but to the naked eye; and in very ſmall ſparks, ſuch as ſoon vaniſhed. I collected they were the ſame ſparks, which we ſaw in the ſun-ſhine by the microſcope.

THE fiſh were not yet fetid, and I cauſed two to be kept for further trial on Thurſday night. And then they began to be fetid, and I expected more brightneſs, but could find none, either in the water ſtirred, or in the fiſh taken out of the water. I boiled fiſh a fortnight after, and failed of the ſhining. I gueſs, that the mixture of the freſher fiſh and pickle with the former did accelerate and enliven the fermentation for ſhining.

SIR, in the laſt clauſe concerning ſhining mackarels I would note, that I attempted the ſame experiment in the ſame manner in all circumſtances, excepting only, that I did not add another of more recent boiling, as in the former; and I could not obtain any ſhining from the ſecond trial, though I kept ſome of the mackarels till they were very fetid. Every night I tried in vain.

I GUESS at random and ſhot proof, that every frozen body gathers a moiſture in the freezing. This may be tried by encloſing duſt or dried earth in a ſealed glaſs, and then freezing it. If it ſhould convert the encloſed air, or collect the aqueous particles, it is to be added to the other obſervations. If it ſhould add to the weight of the glaſs, it would yet be more ſtrange and remarkable. Thus I fill the ſheet, and am always,

SIR,

your moſt obedient ſervant,

J. B.

Yeovill, March 31, 1666.

SIR,

IN what I repreſented for you by Mr. *Oldenburg*, for the immediate conveyance of the ſuperabounding blood of healthful young people into the veins of the aged and decayed (if ſuch a way could be deviſed) I had ſpecial regard to the vital ſpirits, and congenial heat, which may poſſibly have in ſome reſpects a more indulgent virtue, than mummy, or ſalt of human blood. And the mighty power of imagination may be advanced by the choice of the perſon. This I called Tranſanimation, in alluſion to the Scripture expreſſion, "The life or ſoul is in "the blood," which *Selden* interprets of the warm blood in the living animal, which may be part of the ground of the Noachidal precept, as if by ſuch nouriſhment we might degrade our ſouls, and become ſavage, or gigantine. Others, as well as myſelf, have obſerved a valetudinary ſympathy, and a change (even of features, more than one would expect) after conjugal enjoyments, and then more eſpecially, when the affections are mutual, tender and entire. When the wife is breeding, the huſband is troubled with the tooth-ach, and unweildy; when ſhe is in labour, he feels pangs, and recovers in her delivery. Thus in ſome. I have offered other inſtances. But more to our purpoſe thus: an aged perſon (above eighty) married a young maid: a ſharp wit gave ſentence, that he was a dead man, and dropped into his grave. I anſwered, that it was rather his reſurrection, or reſtoration. My ſentence hath held true; by her he hath two ſons unſuſpected; hath lately within two years broken his leg twice with falls from his horſe, bore it ſtoutly, and is again recovered, healthful, and more cheerful, and of a freſher countenance, than before this marriage.

SIR, this I remark, as oft as I hear of the caſe, and I think it is remarkable. In the falacious it may be otherwiſe.

AND as to the baroſcope; if any ſcales could be deviſed ſo exact, as to take the differing weight of air (of any conſiderable and ſtated breadth) at 30, 29, and 28 inches in the baroſcope, we could thence calculate the particular weight of any column, that is found moſt agreeable for any particular man's health, or pleaſure. And till your own accurateneſs ſhall inſtruct us, I dare not confidently affirm, that the aſcent of the mercury does ſtrictly indicate the weight of the air. For mercury is apt to yield to a ſmall degree of heat, and ſeems to boil, before it is tangibly hot. Now if heat ſhould ſwell the mercury, and make it lighter in proportion of bulk, it muſt be ſo much more apt to aſcend higher. And all liquors do alter very much in their weight, as they are warmer or colder. Of this objection I gave notice to Mr. *Oldenburg* ſome months ago.

AND beſides this, the dews amongſt us, when it rains, may (for ought I know) weaken the ſpring of the air, that approacheth the baroſcope, and ſo betray it to give a falſe report of the weight of the whole atmoſphere. For whatſoever hinders or provokes the quick twirlings of thoſe globulous particles, may alter the caſe by a kind of impulſe, or by deadening the force; as it falls out, when the tendereſt ſcales are impelled by a ſtroke of wind, which had leſs weight than the air without it. This may be ſome cauſe of our diſappointments, and put us to a bluſh for the language of our printed obſervations.

I WISH the matter as well tried as might be, by very dampy vapours about the mouth of the baroſcope, or in the cloſet, and then again with charcoal fires, and ſuch pariet works, which do endanger ſuffocation, *&c.*

THE fickleneſs of winds hath alſo given me cauſe to bluſh at my curioſity for half points, *&c.* For my vane is now ſo unſteady, that I can never ſay in what point it is: perchance it is not ſo ambulatory, where the ſpires are far above the neighbouring hills: here the hills are higher.

IN a ſtaneh thermometer of 2 feet length, that deſcended not in the hardeſt froſts of theſe two laſt winters below 5 inches; nor aſcended in ſummer (out of the ſun) above 16, I remarked,

Nov.

Nov. laſt 29, froſt much abated thermometer $6\frac{1}{3}$.

EVENING it leaks, and ſmall rain, thermometer $6\frac{7}{4}$.

Nov. 30, ſnow melts apace before ſun appears, thermometer $7\frac{3}{4}$. This I remarked carefully as a ſtandard, or to be tried in the following winter; ſince which time I have found it freeze quick, when it was above this mark; ſometimes above 8. It was much and often lower in ſome rainy weather, than in ſome froſts.

SIR, may not the hydroſtatic ſettle a ſtandard of heat and cold; as when water is ſo warm as to weigh ſo many ounces per pint? *&c.* For a ſtandard of cold rain at firſt fall, ſo much mercury in a bottle of ſuch capacity, ſo many ounces per pint; but rain fell here, Dec. 19. thermometer $5\frac{1}{4}$; and Dec. 26, thermometer $5\frac{1}{4}$; in ſome froſts lately, near $8\frac{1}{2}$. thermometer in a window, heat may adjuſt it: ſome other poiſe rather than mercury, which ſwells.

IF the little Italian hydroſtatic were remarked, with ſome regard to the round numbers of drams or ounces per pint, it would pleaſe ladies for trials of degrees of heat and cold in liquors, of water, wine, cider, beer, ale, ſtronger or ſmaller, wood-dried or ſtraw-dried malt, *&c.* and ſerve for profounder uſes.

TO another, I ſhould have added above, that if any damps or fumes do alter the weight of air much above the indication it gives in the moſt curious baroſcope over the cloſet; it gives us cauſe to ſuſpect, that it does not indicate the true weight of the atmoſphere.

IN a letter to Mr. *Glanvill*, I ſoftened ſome of the expreſſions, which are in the Tranſactions, numb. 9. pag. 155. more carefully, than to Mr. *Oldenburg*, where I did not intend all for the publick. And I ſaid, that the magnet was known for ſome properties, 2000 years before any of the wits in the world applied it to find a new world, and mountains of the royal metal. It will not be for our credit, if we ſhall ſtand long at gaze, and find no uſes of the baroſcope.

BUT I have filled this paper, and troubled you too much.

GOD preſerve your health, and proſper you in all your noble ſtudies, and in all things.

SIR,

your moſt obliged, and

moſt humble ſervant,

JOHN BEAL.

Yeovill, Apr. 18, 1666.

Honourable Sir,

I HAVE ſeen enough to give me the confidence to affirm, that you have already laid the foundation of ſolid philoſophy ſo firm and deep, that it can never be ſhaken. And if it ſhall pleaſe God, of his bounty to mankind, to preſerve your health and ſtrength (which is the prayer of all that have taſted the fruit of your labours) in a very few years you will reform all our univerſities, and ſet many thouſands on work, to complete the ſuperſtructures, with all the innated ornaments, and with their moſt valuable efficacies.

BUT, ſince you are pleaſed ſtrictly to forbid our applauſes, and do allow me to be your critic, I crave your leave, that I may give myſelf a great delight in viewing, how you have methodiſed your unpubliſhed papers.

AFTER you have taught us, with what ſeverity experiments themſelves ſhould be examined and circumſtanced, and what aim we ſhould have for the choice of moſt conſiderable experiments, and have given us an ample ground-work, your exuberance hath flowed in more ſtreams than we can number, but (as if I thought of the river *Nile)* I will conſider them in ſeven channels.

1. I MUST reſign to your private cabinet thoſe arcana, which you reſerve for your legacy to the Royal Society, and, by them, to the worthieſt of poſterity.

2. The ſecond place is due to the remaining part of uſefulneſs, by which you ſtop the mouths of impudent ſcoffers, and of thoſe counterfeit zealots, who are ſo unjuſt as to demand the uſe of every line you write; whereas they might ſee ſuch a ſplendid account already publiſhed, and more promiſed; and for their own darling (which hath troubled ſo many wits ſo many ages) they cannot pretend to any ſhew of uſefulneſs. And, becauſe this work will grow in your hands, as long as you advance in knowledge, I make it my humble vote, that you would publiſh this by parcel, as it grows up; and to put no full period to it, but to leave it always as the devout Jews did their private buildings, unfiniſhed, and for our further expectations.

3. YOUR phyſico-mechanical appendix is moſt nobly introduced, and there alſo you may give us by parcel, as you find leiſure; for here you cannot end, when you ſeem fulleſt: and the ſtatics in general will raiſe a large and moſt inſtructive bulk of philoſophy. And here you lead us to confeſs the firſt mover, who made all things in order, number and weight; poiſeth the mountains, and agitateth all things, *cribro divino*, by his myſtical ſieve, into their proper natures, and ſeveral regions.

4. YOUR farther explication of qualities will teach all the ſchools better language, convert their verbal quarrels into fruitful deeds, and illuſtrate the whole body of general phyſiology. Nothing can be more powerful to remove and extinguiſh *ſcholarum faſcinum*; *& hoc præſiſcine ſit dictum.*

5. WHEN you ſhall give us your diſcourſe of heat and flame, we ſhall acknowledge, that you alone have accounted for all the elements of old fame, and have given us their juſt names and natures; for heat is our firſt viſible mover, the ſun in the center of this world. When we ſee the ſimple dairy-maid gather her cheeſe by the gentle circling of her

her induſtrious hand, and obſerve how by compreſſure, ſaline ferment, and rennet, the cheeſe in time becomes hot, inflaming, and animated; and when we note the ſtatic laws, by which the butter is gathered, and ripened into oil and flame; then we ſhall better diſcern, how the holy dove ſat on the waters to produce our originals; and how we are ſtill cheriſhed under the ſoft wings of indulgent providences, and tender mercies, for our new birth and reſtoration: and by this time (by opening the ſprings of fermentation, gravity and magnetiſm) you will conduct the two rivulets of mechaniſm and chemiſtry into the ocean of theology. We have ſeen you ſtand your ground ſo well upon firmneſs, and ſo ſkilfully divide the waves of fluidity, and ſo happily tranſcend and ſurmount the air, and ſo ſecurely command the æther and fiery boundaries of the world, *flammantia mœnia mundi*, (as of old they called it) that we ſhall not henceforth moleſt ourſelves about the number, or nature of the elements.

6. OF your other diſcourſes of the ſeeds of diſguiſes, of improbable truths, or whatever elſe you find of eaſy diſpatch, and ſeaſonable, you may free yourſelf at pleaſure; but we have the immodeſty to be always calling for more, and to take all your intimations for good and ſure promiſes.

7. THE continuation of lord *Bacon*'s Sylva, or promiſcuous experiments, will be a pandect to receive all your ſcattered papers, and to reduce them into ſuch a diſorderly order, as falls out oft-times to be better than the beſt method, for all uſes, occaſions, and for immortality. Here you may annex to any piece, that is publiſhed, re-examine, enlarge, explicate: here you enter polychreſts, which cannot belong to one head, nor be confined to few heads: here you relieve lord *Bacon*'s *Sylva*, and his *Novum Organum*, which oft-times want your aid. Here you ſhew, how much you have advanced, both beyond my lord *Bacon*'s votes, and beyond *Des Cartes*'s eſſays, or imaginations.

SIR, I have ſtrong reaſons to urge, that as ſoon as they amounted to a century, they deſerved to be abroad. For thus you may empty your deſks often, and be leſs overwhelmed with your own abundance: thus you may enforce our dulneſs to apprehend our work, and the ſooner you will ſee us work under your commands. Sir, I have a hard ſentence for you, that (confining to the philoſophical affair) never was man ſo deeply indebted to God as you are: and in the ſame account, never was the world ſo much in debt to any man, as we are to you. But it is not in our power to diſcharge the debt. Only this muſt be your comfort, that as you have a rich mercy in what you have received, ſo you have grounds to expect a great reward from the ſame bountiful hand, for your admirable and ſucceſsful induſtry. For you have opened the eyes of all that love wiſdom, to behold, that the works of God are good, and have another luſtre than the notions of the Gentiles, or the cavils of malicious men. And the more liberally you ſhall impart your ſtreams, the more briſkly your fountains will overflow. God preſerve you in his beſt favours and mercies.

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

MY laſt margin of March 31, ſent for you to the poſt-houſe of *Oxford*, repreſents, that heat may be graduated by the hydroſtatick. This I tried, when you firſt communicated the hydroſtatick to me, which was Feb. 27, 1663. If true, it cannot be hid from you; if falſe, I am deluded more than once: and poſſibly we may be ſomewhat diſappointed by the ſwelling and leſs weight of the ☿ in the baroſcope in hot weather. I muſt leave this for better examination, *&c.*

April 28, 1666.

Honourable SIR,

IF you have by this time pardoned my officiouſneſs in ordering your papers, I may now proceed to offer to you ſome very vulgar things, which you will not diſdain, if they may any ways conduce to the diſcovery of the receſſes and labyrinths of nature. This encouraged me to give you an account by Mr. *Oldenburg*, of an experiment, which ſhews what kind of motion, both for figure, and celerity or vigour, gives the beginning, progreſs and advancement of light, or flame; and by the ſame view or rule to gather (as it were) into a method the very principles and proceſſes of fermentation, and of vegetation, and of circulation of blood and ſpirits in animals, and of configurations, colours, and ornaments, and their interruptions, both in concrete bodies, and in fluids, all in a kind of mathematical demonſtration.

You were pleaſed to give notice of the profound changes in nature, as they are manifeſted by the dairy-maids gathering of the cheeſe; and yet there is more of art in that than is commonly conſidered. For a ſkilful dairy-maid brings the cheeſe ſooner with her hand, and due timing of it, than an unſkilful maid, though the runnet and other ingredients were all the ſame, and in the ſame proportion. And (beſides the differing heat of the ſeveral hands, which may make ſome difference, and the vigilance and ſkill to drive the circulation in due meaſure, and to cover and put down the curds ariſing about the middle of the veſſel) there is ſomething more, which the wittieſt of them cannot name or deſcribe, or give for rules, which therefore they refer to the luckineſs of the hand. And (to my knowledge) ſome of the beſt ſkilful have at ſome ſeaſons ſo often miſſed of this luckineſs, that they have believingly and confidently attributed this unluckineſs to witchcraft. Of this I ſhall have ſomewhat to ſay another time. WHEN

WHEN clear liquors are but touched in the middle, or ſides, or wherever, their ſeveral undulations will ſhew the circuits and recourſes of the motion, which may be retarded by thickning the liquors with firmer ſubſtances of divers kinds, more eaſy and more difficult to be diſſolved: or the motion may be diverted, or croſſed, or broken in various guiſes by touches in other places. And this may repreſent the progreſs of nature in all configurations, colours, and ornaments, and ſome reaſons of concurrences, yieldings, and diſappointments.

WORT hath a peculiar tranſplendency, when it is not altered with thunder, noiſe, or violent agitation (which turns it into a thickneſs and acidity;) and the bubbles of wort have a peculiar aptneſs to give all the colours of the rainbow more conſpicuouſly, than the dew of the morning: by putting good balm or yeaſt in the middle, or other parts of a broad veſſel, we may diſcern in what lines it begins to work, and when all figures do ſeem to be blended, by moving and ſtirring it with the hand or bowl, and with laving of it, which drives the circulation from the centre, we ſhall ſee the ſtatic laws obſerved; the foam, bubbles, and lighter parts aſcend; and the heavier parts deſcend; and the viſcouſneſs of the yeaſt holds on this operation for ſome time, and keeps the balance in agitation.

So in kneading of bread, the circulation and time of heaving may be obſerved; and when they gather the dough from the outſides, and work it in the middle of the maſs, the liquor and ferment is driven in the ſame manner into all parts of the maſs, though in liquors the lines of the motion are more viſible.

THE country people call the verdant rings, which appear in the paſtures in the ſpring, fairies dances. I have examined very many of them, and though I found ſome few of them perfectly circular, and many of them inclined to be circular in part, yet I ſaw reaſons and proofs enough to perſuade me, that they all proceeded from the dung of cattle, whoſe ſaline vigour by the vernal dews, and rain, enlarged its circle, as we ſee in the uſual motion of water; but paſſing more eaſily, where the rankneſs or ſoftneſs of the ground did more eaſily embrace the ſaline liquor, by more obſtinate ground the circle was ſometimes interrupted, and ſometimes it was conſtrained to draw a ſtreight line. The ſame chamletings and undulations we may obſerve from a like cauſe in the grains of timber, ſhapes of plants and flowers, variegations of ſtones, and ſome minerals. I have taken up on the ſhores, and land, many ſtones, which being cut, ground, or poliſhed, are a very excellent and beautiful kind of hard marble, ſometimes tough, and white marble interwoven; and ſo perfectly anſwering to theſe undulations, that they needed no other interpretation for the cauſe of thoſe ornaments, than the touch of a child's finger in a pool of water. And thus I have ſometimes obſerved the heart only of a large flint to be a marcaſite, ſometimes the ſtone is only covered or cruſted, with marcaſite, as heat drives the ferment from the centre to the circumference in viciſſitudes; or as it falls out to be arreſted by cold, or the repugnance, or lazineſs of firmer matter. When I read Sir *K. Digby*'s diſcourſe concerning the vegetation of plants, which I had not heard of till very lately, this thought came into my mind, as in ſome degree helpful to interpret or illuſtrate the cauſes of the peculiar figures, not only of the roots, ſtems, heads and leaves, but alſo of the bloſſoms, fruit, and ſeeds, their colours and other ornaments. And I wiſh, that this acute diſcourſe had been divided into diſtinct paragraphs, and each paragraph by himſelf, or by ſuch as bear ſpecial reſpects to his memory, confirmed by the plaineſt or moſt proper experiments; for which purpoſe your ſeveral diſcourſes of Colours, and other qualities, have furniſhed extraordinary aids. Sir, if thus we began ſoftly, and in vulgar liquids and by obvious examples, we might poſſibly arrive in due time to the configurations of all ſtones, metals, and other ſolids; as by *Euclid*'s firſt elements we are enabled by induſtry and attention, to make a gradual progreſs to his more involved demonſtrations.

I HAD lately a brief Latin manuſcript of *a Method, without a guide, to learn all Plants by their Affinities and Differences*, in their roots, ſtems, branches, blades, ſtature, colour, leaves, bloſſoms, fruits, ſeeds, *&c.* I hope my lord *Brereton* hath it yet in his cuſtody. I wiſh it were made publick, not only for the purpoſe of the author, which was not unconſiderable, but alſo for the collections of theſe infinite varieties into few heads, as moſt appoſite to receive theſe rules of interpretation. And yourſelf have done abundantly to furniſh vacant perſons (of which our univerſities do afford good ſtore) for the application. And poſſibly when we can clear our apprehenſions of the nature of gravity and levity, it may give us ſome ſatisfaction concerning the ſyſtem of the world. And this I intended by the late words *cribrum divinum*. All motions in nature ſeem to follow the courſe of ſome ferment, and to be ſifted by heat and weight, as we ſee in the farmer's riddling ſieve, *&c.*

SIR, I ſhould take heed of making any overture to you concerning the progreſs or figurations in glaciation; for it is above thirty years ſince I have ſeen the experiment, and then we had a belief, that circulation did encreaſe and accelerate the operation of the mixture of ſnow and ſalt. And Mr. *Hook* hath well noted, how glaciation hath given or arreſted ſuch motions, as gave the figures of very many flowers, Microgr. Obſ. 14. But I have filled my paper, and muſt ever remain,

Honourable Sir,

your moſt obliged ſervant,

J. BEAL.

From *Yeovill* in *Somerſetſhire*, May 7, 66.

Honourable Sir,

THE man, whom you accuſe of compliment and poetry, well knows, that you have no leiſure for the beſt ſtrength of his ſerioufneſs: and ſeriouſly he thinks he hath a better taſte of your depths, than can be defined in the moſt ſober proſe, or painted in the moſt luxuriant verſe.

BUT, Sir, it is for your health and delight, ſometimes to relax the profounder ſtudies, and to take a recreating proſpect for the view of our wandrings, even then, when the beſt of our apprehenſions do ſeem to you no better, than poetry and ceremonies.

So does the philoſophical poet adviſe you,

Suave mari magno, turbantibus æquora ventis,
E terrâ magnum alterius ſpectare laborem.
Sed nil dulcius eſt, benè quam munita tenere
Edita doctrinâ ſapientum templa ſerenâ,
Deſpicere unde queas alios, paſſimque videre
Errare, atque viam palanteis quærere vitæ.

SIR, after all this preface, I would account for the ground I have to repreſent, how heat may be graduated by weights. And here I pray you permit me to be ſo poetical, as to indulge my ſweet dream, till a ray of clearer reaſon and evidence ſhall awaken me. For ſome of us have neither heads nor purſes to ſtrengthen our diſcourſes with full and proper experiments.

IN Feb. 1663, I noted the float hydroſtatic to deſcend, as the heat of the water encreaſed, and to aſcend in the proportion as it cooled. This I tried lately again, and more than once with like event. Then I gueſſed, that ſome peculiar figure of the float, or ſuch more exact hydroſtatick, as you have ſince beſtowed on me, would note the degrees of heat more accurately, and perchance then beſt, when the poiſe is not of ♀, which may expand, and loſe weight (for ought I know) in hot water.

AND although the graduation will not hold to the encreaſe of weight in all proportions of cold; yet thus we may diſcover, whether cold doth alleviate before it arrives to glaciation; and thence we may enquire, whether any glaciation doth alleviate to ſuch proportion as may reſemble the coincidence of extremes, when *penetrabile frigus adurit*.

AND I ſee by ſeveral of my own thermometers, that the glaſs-men are by you ſo well inſtructed to make the ſtems in equal proportions, that if we could name ſome degrees of heat by a certain weight, we might by the proportions of the glaſs make our diſcourſes intelligible in mentioning, what degrees of cold our greateſt froſts do produce.

THEN I thought, that if rain-water, as ſoon as it fell, might, by a ſingle or double diſtillation, be brought to the ſame degree of purity and fluidity in ſeveral climates, and at differing ſeaſons, thus the degrees of heat might be aſcertained by weight, and the degrees of cold inferred by the equable proportions of a thermometer, that was regularly graduated for heat, &c. &c. Here I have not expreſſed my ſelf fully, but you will apprehend my aims.

IF we can diſcourſe of heat and cold in their ſeveral degrees, ſo as we may ſignify the ſame degree intelligibly, though it be by any compaſs or juncture of evidences; it is more than our forefathers have taught us to do hitherto.

SIR, I have ſome ſtore of theſe adventures, but this is in preſent a ſufficient interruption. You will bear with me, if I affirm, that one may find more philoſophical demonſtrations, and more liquid proofs of the generations and corruptions, and various alterations of very many things, in ſome vulgar trades, and manufactures, than I could gather out of numerous volumes of ſeveral good libraries.

LAST autumn I had leave to ſpend a whole day in obſerving the ſweet chemiſtry of a lady, who is moſt perfect in the art of making marmalades, and conſerving fruit in all their approved colours; and ſhe hath taught me to confeſs the miracles of heat. It is ſure the philoſopher's ſtone, that can do and undo all things; and it is not in the power of orator, or poet, with ink and paper, in proſe, or in verſe, to lay down the proceſs, how to make a good cawdle, poſſet, or pottage.

AND therefore, Sir, if you ſhall taſk me about fermentation, (as you ſeem to threaten) be pleaſed firſt to inſtruct me what operation there is in nature without fermentation, that I may ſingle out my proper object; and be pleaſed to teach me the nature of gravity, before I take the balance in hand, to eſſay the ſtatick laws.

SIR, I am not ſo much an enemy to poſterity, as to expect your returns to ſuch letters as theſe. Only if you ſhall pleaſe to give me your commands by our good friend Mr. *Oldenburg*, you ſhall ſee that I am ſuch a zealous lover of your perſon and buſineſs, that I ſhall rather betray all mine own weakneſs, than forget to be very induſtriouſly,

Honourable Sir,

your moſt obedient ſervant,

J. BEAL.

Yeovill, July 13, 1666.

Honourable Sir,

I KNOW no other ſhelter from the apprehenſion of our horrid wars, but only by a more ſerious diverſion to theology and philoſophy; that the nearer the horrors do approach us, the more attentively we may indulge theſe retirements, in which you have liberally conferred on me my beſt philoſophical entertainments. For theſe I have a grateful ſenſe; but, ſince I am unable to make any return in the like kind, be pleaſed to permit me

me once more to trifle upon your methods. Of which I have yet ſomewhat to ſay to you, being encouraged, in that I do not diſcern, that you took any offence, when I ſo lately uſed more boldneſs towards you, than I durſt adventure towards any other perſon, of whatever complexion.

HERE I ſhall deliver my thoughts, in what order your writings, which are already abroad, and thoſe alſo, which are by you intended for the publick, ſhould lie.

AND firſt I muſt conſider, that what you have done, will never be undertaken again in the whole. Something perchance in time may be added to them; and much may be ſuperſtructed on them; and by parcels they will be recited and applied to other methods; to diſcourſes of all ſorts of mixed and compounded bodies; of vegetables; and of animals: but no man, that hath reaſonableneſs, or ſtrength enough to hold up in any credit, or reputation, for half an age, will ever attempt the ſame arguments again. And therefore I do earneſtly ſolicit, that you may ſee them publiſhed in ſuch manner, as may be fitted beſt both for libraries, in which they may be preſerved permanently; and alſo for the moſt expedite manual uſe, in readineſs at all times, and at hand both at home and for companions in our travels.

FOR all which purpoſes (in my opinion) it were very convenient, that all the parcels were abroad in quarto, and rather in thinner tomes, than in thicker; and I humbly offer my reaſons.

1. THAT bulk is not incongruous for libraries, and more men do find it eaſieſt, and handſomeſt for common uſe.

2. SUCH as have defective eyes; and thoſe alſo, who have the beſt, and moſt laſting ſight, being neither pore-blind, nor clear ſighted, for great diſtances, nor able to endure much light, nor yet much darkneſs, cannot with eaſe uſe great folio's; and are therefore conſtrained to cauſe the book-binders to ſubdivide them into thin and light volumes, that their hands may the better ſupport them to ſuch approaches of their eyes, as may afford the juſteſt proportions of light and ſhadows, as beſt agrees with their ſight.

3. IN ſuch thin volumes, and of that moderate bulk (in quarto) every man may ſort them in a method more agreeable to his own humour and concernments.

4. THAT bulk is fitteſt for the cuts, which ſhould not be in folds, which are ſoon worn out, and are ſubject to many miſchances; but ſhould be in pages, as many as are neceſſary.

5. AND we ſhould have the more care of all accommodations, becauſe of the great difference between experimental philoſophy, and that which is looſely notional. For ſuch writings may be only ſkimmed over, as with the glance of the eye, and one reading may ſuffice for all: but theſe do require a frequent and aſſiduous review, and a kind of incubation, as for innumerable applications, for remoter diſcoveries, and for ſeaſonable inventions upon all imaginable occaſions. And certainly, if a mere liſt of experiments were only ſet down in a naked, but full narrative, a ſmall volume might ſuggeſt for ſerious, and long induſtry; ſince, every marginal reference might advertiſe of a freſh method by union, parallel, graduation, limitation, and thouſands of other inferences, whereof ſome might prove of comprehenſive and pregnant importances. And a liſt of experiments well choſen will hold out againſt all times, as firmly, as any of *Euclid*'s propoſitions.

SIR, the marginal remark is to ſignify, how you may make an hundred experiments ſerve for a thouſand uſes, and eſcape all oppoſitions.

AND now the method, which I do ſoftly and tenderly propoſe, is as followeth.

1. USEFULNESS may be firſt, or laſt, or both. It may be firſt, becauſe in all practical tractates, the end ſhould give the firſt encouragements and directions; and herein you have particulariſed, explicated, appropriated and exemplified thoſe fair encouragements, and affectionate directions, which my lord *Bacon* had in a wide and ſpacious generality eſſayed, or conjecturally propoſed. And then the uſefulneſs will hold on a good claim to the laſt place, or as long as, by our progreſs in philoſophy, we may hope to raiſe any accommodable inventions.

2. OF the Phyſiological Eſſays; the introduction, and the two treatiſes of unſucceſsfulneſs, as preliminary to inſtruct the accurateneſs of experimental obſervations and ſpecifics.

3. THE Origin of Forms and Qualities, which, if in quarto, and in ſuch a cloſe print, as the Phyſiological Eſſays, will make no large ſeparation between thoſe eſſays, and the eſſays of Heat and Flame, which ſhould next ſucceed. For theſe Phyſiological Eſſays do fitly preface for much caution, and frequent examination of the tickliſh operations of fire.

4. HEAT, which is uſually reputed the firſt of the four primary qualities, and is the briſkeſt agent in all motions of generation, corruption, and alteration; and flame, which carries the reputation of the firſt element, as in motion, and upon the very wing for aſcent, do deſerve to lead the reſt, whether qualities, or elements, as they are called.

5. THERMOMETERS, and cold, with the appendages, do claim to ſucceed heat, and to be put into the ſiniſter balance to counterpoiſe the ſwift motion of heat. This in a ſecond edition ſhould be in quarto, and the additions inſerted in their due places, Dr. *Merret*'s diſcourſe being united for a double teſtimony to ſome particulars.

6. HERE ſhould be fluidity and firmneſs, as making up the four primary qualities of old account, not omitting the main of the preface for the ſolicitation of a good correſpondence between the corpuſcularians and chemiſts, and what elſe you have as appendage to the experiments upon ſalt petre.

7. COLOUR

7. COLOUR and light may lead the qualities more eſpecially attributed to the ſenſes, the ſight being reputed the nobleſt ſenſe, and light a noble nature.

8. HERE whatever elſe you ſhall publiſh of ſubordinate Forms, or of ſecondary Qualities, either according to the order of the ſenſes, or as otherwiſe you find the gradual information (whether manifeſt, or occult) better inſtructive. But I ſhould refer it to your own only judgment to place theſe. For who can better order them, than he, that can ſo fully diſcover their natures? The peripateticks, by their diſagreeing and clouded notions of mixtions, have put themſelves into ſuch confuſions, that it gave *Wendeline* juſt cauſe to ſay, *Quot phyſicorum ſyſtematum ſunt ſcriptores, tot ferè de ordine qualitatum corporis naturalis ſunt ſententiæ.* Some excluding all qualities from the general affections of bodies natural, therein following *Ariſtotle in libris acroamaticis.* Others aſſuming tangibles, viſibles, and audibles, as the common affections of natural bodies; and referring the objects of odour and guſt to the mixture of their four elements, not to the elements themſelves, nor to the celeſtial bodies, ſay they. As far as I can dive into theſe matters, to me you ſeem to have gone through the hardeſt parts already, and to have cleared the way for the reſt. For ſounds do ſucceed colours, and odours ſounds; then taſtes, and laſt of all tangibles. And perchance the difficulties and intricacies of their natures are more or leſs, according to this order; ſounds having a difficulty next to colours and the tangible qualities, which belong to the loweſt, and dulleſt ſenſe of touch (at leaſt the remaining and ſecondary order of them) being not hard to be explicated. For, ſince you have provided us a liquid and ample account of the four chief of tangibles, heat, cold, fluidity, firmneſs, we have hereby a good foundation to be better acquainted with that, which they call hardneſs, or the ſtrength or ſtiffneſs of conſiſtence, and with the contrary ſoftneſs; with lentor or toughneſs, and friability; and then the remaining qualities, denſity, and rarity; craſſitude, and tenuity; aridity, and lubricity; aſperity, and levity, or ſmoothneſs, have in their notions no abſtruſeneſs, their natures apparently conſiſting in the inequalities, location, ſituation, adheſion, firmneſs, or contexture of parts, as they are ſevered united, mixed, or abated more or leſs. But to find the operations, which do beget theſe qualities or poſitions in ſeveral mixtures, and which properly belongs to our practical philoſophy, it will require a portion of your ſtrength and light to guide us in it. And if it ſhall pleaſe you to make ſome entrance in this place, to give us the proper motion and vehicle, which carries and embodies ſounds, odours, and taſtes, we ſhould think it reaſonable, that you refer many of the abſtruſities of theſe to the argument of ſenſation, which ſhould follow after the account of vegetation.

To give my reaſon, why I do here place heat, cold, fluidity, firmneſs, which are reputed tangible qualities, before colour and other objects of the nobler ſenſes, and leave other tangible qualities to be ranged after theſe, I ſhall ſay,

1. I DO herein ſubmit and comply with the expectation of ſuch, as do require an account of their four elements, before qualities. For in theſe tractates, as by you they are handled, thoſe men may find more ſatisfaction concerning their elements, than in all their volumes of notional Philoſophy. And in a due ſeaſon, they will be ſhewed the emptineſs and fruitleſneſs of all former undertakings in philoſophy.

2. HERE was the fitteſt place, and the fulleſt arguments to refute their prejudices, and trifling conceits, concerning ſenſible qualities, which are by demonſtrations of reaſon refuted in your Origin of Forms and Qualities; and in the following tracts more particularly diſcharged, as by manifold demonſtrations of matter of fact.

THIRDLY, and chiefly, we have hereby a more regular opportunity to conſider theſe qualities, according to their true and real natures, and the motions of thoſe particles, by which the ſenſes are affected. And (to ſay it rudely and bluntly) no ſenſe is otherwiſe affected than by touch, as the ſmart of the eye, and the tearing of the ear, as well as the haut gouſt to the noſe and palate, does ſometimes teſtify. Thus much for defence of the method, which I have propoſed for the notion of qualities; but I do more willingly refer it to your own advice.

10. IN the tenth place we ſtand in great want of your explication of gravity. Of which I have not ſeen any hypotheſis, which accounts for all the phænomena, which are obvious. This, if I can obtain leiſure from my importunate engagements in theology, I may chance to repreſent to you more at large, as only to point out where I find the perplexities. To provoke you to this taſk, I will only entreat you to look back upon your works recited, and ſee in what coherence you have given us the firſt view, that ever mankind had of the general body of phyſiology, all publiſhed already, excepting only the account of ſecondary Qualities, which are in your hands. I may add, that we have been diſciplined and accuſtomed to look for the tractate of gravity amongſt the qualities. But I urge it more eſpecially, becauſe it will unite and link together many other of your moſt elaborate works to the forementioned. And perchance it is the very poiſe, which makes the balance dance, or conſtrains the motion in all natural operations. And alſo I conceive it may receive ſome conſiderable aſſiſtance towards the diſcovery of it, from the hydroſtaticks, becauſe the tendency, and agency, as well for motion, as for reſt, (if there be any ſuch thing as reſt in this world) and the co-operation and the reſiſtance of bodies in their ſeveral degrees of gravity, may better be diſcerned in the more viſible fluids, than in the air, which is inviſible.

And this poiſe or gravity ſeems to me to lead us into many very large enquiries, both relating in general to the whole ſyſtem of the world, and to many productions in mixtures, and perchance may equally pertain to the mechanical, corpuſcularian, and chemical branches of philoſophy; and to your diſcourſe of Magnetiſms.

11. THE eleventh or next place is due to the Hydroſtaticks.

12. THEN your copious phyſico-mechanical Experiments, which do ſeem to perambulate over the moſt ſpacious fields of nature, and to penetrate into her receſſes and labyrinths. And very happily hath the air (which the poets attributed to their proud queen *Juno*, Βοῶπις πότνια Ἥρη) obtained to be the firſt great body, or elementary maſs, that is ſo accurately examined by your incomparable and moſt inquiſitive induſtry.

AND here your adverſaries will have the honour to be commemorated in your ſeveral vindications and appendages.

13. AFTER all your phyſico-mechanicals, I ſhould allot this remoter place to your ſceptical Chemiſt, which others (I believe) would place next to the Origin of Forms: but I have already rendered my reaſons, why thoſe treatiſes ſhould not be disjointed, or interrupted: and furthermore thoſe chemical principles have not been ſo generally received in our publick ſchools and univerſities, nor do carry ſo high eſtimation in current antiquities, as may claim a ſuperior place, than is here allowed them.

14. AND hereunto may be adjoined the Sceptical Naturaliſt, or the Account of the Imperfections of natural Philoſophy, as we yet have it. Although yourſelf will not only ſurvive, but accompliſh the refutation of that diſcourſe.

15. AND then you have a due place for improbable truths.

16. OUR next care would be due to our mother the earth, *tellus mater omnium*, ſaith *Varro*. And here alſo you are beſt able to give us directions to find out the changes, rules, and ferments of the earth for fertility and agriculture. And the treaſures of minerals and medicines, that are locked up, as jewels in the rocks are laid deep in the bowels of the earth; and good directions may be more than a guide on the way for all future diſcoveries. I ſee rags, leather, metals, all things, that are caſt out upon the face of the earth, in time reſolve to earth, and then to invigorate liquids to aſpire into all the flouriſhing beauties of the fields, and gardens. This travail of ſpirits will bring us to the golden branch, which will be a wand to ſecure our walks through the Elyſian groves: and this part of beautiful philoſophy is not neglected, but plentifully cultivated by many hands, and in a fair progreſs towards perfection in time.

AND I have in my late letters mentioned to you a brief manuſcript, which I had from Mr *Hartlib*, *De cognoſcendis ſine duce herbis*. Probably it may be in your hands, and I wiſh you would take the trouble upon yourſelf to employ ſome well-willer (a vacant academician) to tranſlate it into Engliſh, and then to beſtow it upon the publick, with a preface of your own; and there you might find opportunities, where you pleaſed, to exemplify what you have written of colours and other qualities in that general phyſiology. And this is as the application of the alphabet to reading and learning of words and ſentences. Here, in a little, much (and perchance enough) may be ſoon done. For though old philoſophy wandered far out of the way in notions, yet when they deſcended to particulars, they did not do nothing. Here you can more cloſely diſcriminate ſpirits and juices by their ſeveral indications, and call for the proper uſe of the microſcope to diſcover the contextures proper for ſeveral kinds of vegetation. But this you have done already by Mr. *Hook*, who can never get leave to take off his hand from that work, if ingenious men can prevail with him.

18. AND this leads me to the account of the ſenſible plant given by Dr. *Clark*, and Mr. *Hook*; and from thence by a gradual aſcent from vegetables by Zoophytes to be prepared for.

19. YOUR two Eſſays concerning the concealments and diſguiſes of the Seeds of living Creatures.

20. AND here, if you in that way can teach us to apprehend ſenſation, it will be more obliging than all, that *Ariſtotle* and many modern writers have elaborated, *De animalibus*, or *De piſcibus*, though neither the old induſtry, or the later additions in theſe points be contemptible, but not in their kind admirable.

21. BUT I had rather ſee the Anatomy of Animals by your inſtructions undertaken and publiſhed in effigy with good cuts, than all the outſides alone. Of this I have ſuggeſted ſomething more particularly to Mr. *Oldenburg*, and intended for your ear by his favour and not for a trouble to your eyes: there I do urge reaſons, why this work ſhould be begun upon dogs, and to what ſpecial purpoſes.

SIR, your firſt pardon begot all this confidence; and ſurely you will dive ſo far into my boſom, and heart, as to call it the licence of ſincere reſpects, and affections. Only I can plead, that no part of this is contradictory to the former. But as in the former I conſulted for your own eaſe; ſo here I ſolicit mine own and univerſal accommodations, which ſeem to make up but one trifling motion, that your works may be printed all in quarto, as being a bulk more conducible to preſerve them all entire ſafe, and for frequent uſe to poſterity. Neither does this exclude or diſcourage the fineſt prints for the pocket.

SIR, I do always pray for the beſt of bleſſings to encourage your great example for a ſtronger influence in a diſſolute age, and I preſent my moſt humble ſervice to the excellent viſcounteſs *Ranelagh*, and to her generous daughter.

Sir, your moſt affectionate ſervant,

J. BEAL.

Yeovill, July 30, 1666.

SIR,

I HAVE need to haſten theſe to deprecate for my laſt unluckineſs. For now I apprehend, that I ſtumbled at the threſhold; which was a fit omen for one, that puts his ſickle into another's harveſt.

SURELY your Sceptical Chemiſt ſhould immediately follow your firſt introduction; and take up the place, which the ſcholars do give to their *tria principia*, which do hold us in thick darkneſs for a large tract of their initiating volumes. Here in many rich experiments you give a very ſubſtantial account of the manifold guiſes of their firſt matter (perchance as far as really it can be repreſented, or pretended) you examine all claims to principles, or elements of a fixed number, and give us a clear view of *Miſtion*, both in general, and in leading particulars, and ſhew us how to ſearch the originals of all materials to the utmoſt extent of their capacities.

AND perchance to this you will think fit to adjoin your Sceptical Naturaliſt, which is not yet abroad.

AND then to place the two diſcourſes of Unſucceſsfulneſs, becauſe they warn us of an extraordinary accurateneſs neceſſary to diſtinguiſh ſome ſimples of like reſemblances; and of the ſtricteſt manner, and meaſure, and order of operations.

AFTER theſe difficulties, and obſtructions thoroughly by you noted, the Origin of Forms and Qualities will break forth, with a more poſitive, explicit, and refreſhing ſplendor; and call on the reſt to add gradually more rays, as by a continual advancement with freſh examples, and further demonſtrations.

SIR, I could not thank you for your ſtatical baroſcope in my laſt, for I had not then ſeen it. But now I may take the bluſh upon myſelf, for that although you had done it long before I did ſolicit you for it, yet perchance you yielded to the immodeſty of my importunity, in publiſhing it amongſt fragments apart.

YET I think I may excuſe myſelf, and defend your condeſcenſions, if in ſuch leading and pregnant inventions, you ſuffer yourſelf to be provoked both to ſcatter them by parcels, and do alſo conſerve them in the main body of your full diſcourſes. For by this time you have only begun philoſophy to the world; but you are now concerned to carry the ſtream, and to overlook what progreſs others can attempt upon the aids, that you have ſo amply adminiſtered.

THIS oeconomy we may learn from our moſt clangorous enemies the Jeſuits, who (by theſe arts of dreſſing for the pocket in fine prints the groſſeſt errors) can caſt a miſt to blind the eyes of many wiſe and ſubtil perſons, and obſtruct the brighteſt rays of heavenly truths. In a good cauſe we ſhould try the ſucceſs of the ſame arts.

AND truly I am confident, that by your philoſophy you have converted the very Jeſuits to make ſome recompence for the deſtruction they have ſo long made of mankind, that by their univerſal commerce, inceſſant induſtry, and bottomleſs purſes, we may receive uſeful intelligence, and experimental informations from all parts of the world. This comes into my mind, more eſpecially upon the reading of philoſophical Tranſactions, num. 14. p. 249, the fifth paragraph, which begets in me the wiſh, and hope, that the Jeſuits (who are ſaid to have their reſidence in *China*) would give us the tranſlations of their chief books (old and new) of ſimples, herbs, plants, ſtones, of medicine, chemiſtry, *&c.* For it is like they may ſignify ſome other things than ours do, which follow uncertain traditions for the moſt part. Some of them have obliged us from *America*, and the like, or more they may do from *China*, as your example does guide, inſtruct, and entice them in conſiderable citations.

SIR, after all this adventure, I muſt not be afraid to tell you, that you owe us another clauſe upon your ſtatical baroſcope. For here you eſcape *Hobbes* and *Linus*, and can excel yourſelf in calculating the weight, and aſcent of the air (and mixtures perchance) at another certainty, than by the other way.

HOWEVER, this is my ſtrange way of begging pardon for my former faults. He muſt be a dull man, that can forbear it.

SIR, it is almoſt time, that you ſhould be altogether free from the manacles and fetters of ſtiff methods, and ſhould take the liberty of the bee, to pick and chooſe (at your own pleaſure) from all the flowers of paradiſe. And you have already not only formed the cells ſufficiently, but you have alſo filled them. But that is not a work, that is to be perfectly completed in this age or in this world. And therefore, ſince the whole is unfeaſible, you have the more obliged us, by conducting us through the moſt neceſſary, the moſt ſubſtantial, and the moſt uſeful parts of it; ſuch as afford us the ſafeſt delight, and the kindeſt entertainment. And every man thinks he could wiſh you more eaſe, and freedom, if once you had rid your hands of your own papers. But I doubt their wiſhes would covenant for impoſſibilities; for ever-flowing ſtreams are not eaſily emptied; and your additions may not out-run the ſpeed of your amanuenſes. But I had rather ſtop your courſe, than drive you on, becauſe I wiſh you firm health, and long days.

AND to invite you to refreſh yourſelf upon your own writings, which may both increaſe your margins, and preſerve you from a worſe waſte of time upon others wandrings, I muſt conclude theſe with a ſtory. *Jul. Scaliger* extols *John Suiſſet* calculator (as he was denominated) for the ſharpeſt, the profoundeſt, and the moſt elaborate writer, that ever the ſun beheld. And they ſay of him, that in the decay of his age, when he would have reviewed his divine works, he fell a weeping exceſſively, becauſe he was not able to underſtand what himſelf had written.

SIR,

SIR, I do not threaten you with this judgment; for you wrote light, and he wrote darkneſs. But if you do not keep your eye frequently upon your own margins, you may live to find the perfections of grey hairs, which do ſometimes ſteal our own labours and inventions out of our memory: and who elſe will put you in mind of this?

SIR, I do heartily pray for you, and the ever honourable viſcounteſs *Renelagh*.

Your moſt humble ſervant,

J. BEAL.

SIR, Mr. *Glanvill* wrote to me, that one Dr. *Harmar* had a good Latin pen, and an eaſy inclination to tranſlate into Latin, that Origin of Forms, *&c.* or Hydroſtaticks, or both; I know no more of the man, or of the maſter. This I was deſired to ſay to you.

Auguſt 10, 1666.

SIR,

LEST you ſhould be deterred by the bulk of the annexed, I may premiſe thus much of recommendations.

THE argument is noble, and both requires and highly deſerves your own advice in the proſecution of it.

THE recited examples are beyond all that I have read or heard of, in any age; yet we have been in a manner eye witneſſes to the truth, conduct, and effectualneſs, ſome the moſt dangerous, others the moſt obliging, all very inſtructive, and no leſs conſiderable. And you are perſonally, or (at leaſt) affectionately concerned to make the application.

I HAD preſented it in a better hand (which had alſo afforded the opportunity of a more chaſtiſed ſtile) if I durſt admit an amanuenſis to ſee my boldneſs, or to pry into the deſigns. And here I make promiſe, that I will give you no more troubles in theſe matters.

Honourable Sir,

your moſt humble ſervant,

J. BEAL.

SIR, if you think fit, Mr. *Oldenburg* can make the whole, or any part more legible.

Incloſed in the preceding.

SIR, Aug. 10, 1666.

I DO not forget, that you have rendered ſufficient reaſons againſt the preſumptuous affectation of methods, and haſty ſyſtems; yet we ſhould alſo take notice of your conceſſions in your Procemial Eſſay, pag. 5. and 6. that there is a uſefulneſs and a ſeaſon for ſyſtems. And certainly, when ſtore of good materials are collected (be it of cement, ſtone, timber, and metals) it will have more uſefulneſs, ornament, and ſtrength, if ſkilfully ordered into a fit building, than in a confuſed heap. Order gives facility, and luſtre to every buſineſs. And this may plead for my laſt officiouſneſs.

BUT now I have, with a like freedom, further to ſhew you, that you have performed the hardeſt taſks in philoſophy, and yet you omit, and perchance neglect to reap for yourſelf, and to ſolicit for others, the main benefit and application: Or (to deliver my thoughts in a reſemblance not altogether improper) you have found out the polar uſes of the loadſtone, and the aſſiſtances it offers for navigation; but you have not applied it to diſcover the other world, and to fetch hither the ſilver of *Potoſi* and the gold of *Peru*. This my boldneſs you will the better bear, if you can have patience to receive my explications; and then I hope I ſhall not moleſt you in this kind any more.

WE do ſometimes look about us, and take a proſpect upon the times paſt, that from thence we may deduce a conjecture at the times to come. When we ſee what events have followed; what the cauſes; what conduct hath failed; and what hath ſucceeded; we may thence take the more likely guidance for the preſent, and may be the better aſſured of the future.

UPON this note, I will firſt call to memory, that when I firſt entered into *Cambridge*, the Ramiſts were in ſuch great eſteem, that we gave very high rates for ſuch of them as began to be out of print; but within three or four years they fell ſo low in credit, that we might buy them at the rate of tainted fiſh, or *Iriſh* beef; ſhops full in *Cambridge*, and cart-loads in *Sturbridge* fair, at one penny per pound. This fell out without the ſolicitation of any party or faction, or other concernment, merely by the prevalence of ſolid truth, and reaſonable diſcourſes. This may ſhew us, that ſome truths are of ſuch worth in their native ſplendor, that they have no need of other dowry. And to this (for our preſent comfort) I may farther add, the infinite or vaſt difference of luſtre, which this experimental philoſophy gives in all (and thoſe innumerable) branches of it, much more alluring than all former diſcoveries, which indeed were but notional and fantaſtical.

SOON after, the ſame fate befel Calviniſm, in both our univerſities, and yet that claimed the title of Holy Oracles; the uncontroulable myſtery. It was defended by the flouriſh of invincible chairmen, *Collins*, *Prideaux*; by ſwarms of writers, and diſputants, the noiſe of pulpits, all pretences of zeal, and the juncture of many foreign, and national correſpondencies. Yet in a ſhort time theſe painted oracles were reputed no better than the horrid riddles of Sphynx, or groſſer blaſphemies. And as the Delphian Oracle, at the firſt appearance of our Saviour's Aurora, ſhrunk from his tripodes, and ſtole to the cottages of trivial witches; ſo did this new doctrine deſert the throne and chairs of the univerſities upon the reſtoration of better antiquities;

antiquities; and hide itſelf in the ſmoke and ſmother of plebeian pulpits.

IF you permit me the boldneſs of my reflections upon theſe two changes; even in thoſe my younger days, theſe Ramiſtical dichotomies ſeemed to me like a taylor's ſhears, cutting all our beſt cloth into ſhreds, or rags; and the Calvinian doctors, dancing in the circles of their nimble diſtinctions, were as ridiculous, as the maid-morrian and hobby-horſe in a morrice dance.

AND, though thoſe latter did put a countenance of gravity on it, for a while, and maſked their riddles under a vizor of devotion, yet when they found, that the younger ſtudents (ſuch as were ſcarcely graduated) did by the aid of ſtronger arguments, and by the advantage of true and authentick antiquities, ſo far excel the whiffling doctors in their lectures and diſputations, the elder men grew pale at it, and the elder truth prevailed. I ſaw thoſe old and rotten ſtandards ſo often fallen by the ſharper hatchets of the youngeſt graduates, that it may direct and admoniſh us, not to deſpiſe to furniſh our younger and ſwiftly growing academicians, with the ſtore of your well tried weapons; and I am confident, that thoſe froward and diſingenious medlers, who do reſiſt and reproach the light, would ſoon be convinced, that they fight againſt themſelves, and all their own ſenſes, and do pull out their own eyes, as oft as their tongues do wag againſt your experiments.

SIR, here I would ſoftly inſinuate into your ear, that we are not ripe for theſe ſucceſſes, nor can have juſt ground of expectations, till you ſhall pleaſe to draw forth your experiments and obſervations into hypotheſis, ſuch as they do fairly bear, and unite them as far as they give mutual ſtrength, and light, and aſſiſtance. For though it be good to learn firſt to ſpell well, yet we muſt not leave off there, nor reſt there too long. And I cannot diſcern a reaſon, why you ſhould continue ſo ſhy of advancing to ſome poſitiveneſs, after ſo large a view of ſo many experiments, and ſuch mature experience; and without a ſeries of ſome propoſitions, and ſome ſyſtems, it is impoſſible to carry a ſtrong vogue in our univerſities; who, when they ſee the neceſſity of experimental demonſtrations for their conqueſt (even in language and diſputations) will ſoon and gladly exchange their impertinent volumes, for quadrants, rulers, alembics, and curious ſcales, *&c.* And thus diligent ſtudents might be enabled both to underſtand ſomething aright, and to do ſomething. And thus you draw both the univerſities to your aid.

MY next note will point out the conduct, which never failed either of ſucceſs, or of diſpatch.

I HAVE formerly hinted unto you, how the Roman ſeminaries, and eſpecially the Jeſuits, do infatuate the world, as well by their ſhort manuals, as by their endleſs volumes; yea much more by their breviaries, than by their tomes: by the grandeur of their volumes they overwhelm or amaze them, that have leiſure to dwell in their tents; but by their ſingle ſheets they catch him that runneth by. By theſe they have an opportunity upon every man's moments of leiſure; theſe are the ſhort daggers, which ſtab to death in every corner of darkneſs. The ſhorter and more ſevered they are, the more are they like wedges to cleave the ſimple proteſtant into ſhivers, according to the proverb, *divide & impera.* And every ſingle dart pierceth deeper than a bundle; and thus every man may be ſingled out, and taken in his own humour. And thus the chief artiſts amongſt our ſectaries (for they are ſore wedges alſo) could cleave us with their inviſible darts.

BUT I never ſaw this ſtratagem, or ambuſh, more effectually managed, than by the Socinians, who, when their name was odious to all the world, magiſtrates, and miniſters, and all men armed againſt them, and enraged; when they might ſay, they had neither holes, as foxes have, nor neſts, as birds; neither college, nor glebe, nor revenues, nor ſhelter, but a mere connivance for a time in *Cracow*, and that alſo merely upon a deſign of ſtate, to quell ſome ecſtatic Anti-trinitarians by the Socinian more ſober pretence to ſtricter reaſon. Yet in all theſe diſtreſſes, and exigencies, by the few or ſingle ſheets of their brief manuals, as with poniards, they fell upon all parties, without noiſe, vapour, challenge, or quarrel; they ſingled out the ſtrongeſt and moſt famous Jeſuits, and, as if they had learned the Ovidian verſe, *Medæa Medæa forem*, they charmed the witch, and purſued them, and almoſt undermined them in all their coverts. I can look on them only as a bee faſtened on the noſe of a bear; yet I cannot but eſteem them, as the only viſible agents, that in time may divide the Jeſuits amongſt themſelves; for I ſee, that all the ſubtileſt Jeſuits, that I know, have taken up a doſe of their infuſions, even whilſt they rail openly at them; and I dare affirm, that they do perplex them more than all the Janſeniſts, which have the beſt of the old Roman pretences, ſo many ſwarms, colleges, revenues, and parties, to back them. And we ſee they have laid their hot irons in all parts of *Germany*, got many of the Remonſtrants in the Low Countries into their party, and there have their fair printers, and learned advocates, antiquaries, every thing.

CERTAINLY, I ſaw, how the Socinian ſhreds eſcaped the moſt watchful eye, and the ſevereſt ſearch of the acute arch-biſhop Laud, and did, at the ſame time creep into the pockets and boſoms of his moſt intruſted chaplains, and (every where) of ſuch ſecretaries of ſtate, as had learning. Of this I know more than will be eaſily believed.

TO leave this odious example (and yet we ſhould not diſdain to learn of our ſharpeſt enemies) I can ſhew it with more unblameable luſtre in the ſucceſſes of *Eraſmus*, whom I take to have written the moſt and the beſt, that ever man wrote; yet almoſt all were firſt ſent abroad in very few ſheets, or ſmall enchiridi-

ons,

ons, and did infinite good all over the Chriſtian world, to allay the furies of that age, and for the general reſtoration of literature, conſiderable antiquities, and holy truth. To inſiſt on this inſtance more explicitly, and more particularly. If *Varro*, amongſt the Gentiles, and *Origen*, amongſt Chriſtians, wrote more than *Eraſmus* did, yet the remains of *Eraſmus* amounted to ten tomes of large and full folios in a pretty cloſe print, as himſelf collected them, or computed them eleven years before he died; beſides that many of his beſt approved compoſitions were loſt by fraud or negligence, as himſelf then complained; and he ſays himſelf had burnt ſuch of his letters, as he could recover, which were then almoſt two cart loads. *Epiſtolarum tantum ſcripſimus, & hodie ſcribimus, ut oneri ferendo vix duo plauſtra paria ſint futura: ipſe multas caſu nactus exuſſi, nam ſenſi ſervari a compluribus.* But a full tome of his letters have eſcaped, and do remain a monument, not only of the glory due to that man, but alſo of the glory due to the princes and potentates of that late age. For there we find it amply recorded, and ſpecified, how freely, and familiarly, and ingenuouſly, this man of plebeian birth, and of very ſlender fortunes (as himſelf would have it) held for many years, even for almoſt half an age, as it were weekly correſpondence with all the popes, emperors, kings, cardinals, princes, miniſters of ſtate, minions of fortune, and with all the eminently learned, with ſuch unbiaſſed ſincerity, as if he ſcorned all intereſts, and diſdained to glance a ſmiling eye upon ſecular greatneſs.

THIS man with great judgment gave us the choiceſt of Grecian and Roman antiquities, for all the ornaments and uſes of philology, morality, and true theology: reſtored the beſt of the Gentiles, as well as of Chriſtian fathers, to themſelves, recovering them from duſt, worms, and worſe-defacing-ſcribes, into the light of the faireſt impreſſions; and with his ſmart apologies, ſmiling reprehenſions, and healing laſhes, conſtrained all the neſts of lazy monks, as well as the ſwarms of overbuſy ſectaries, to attend to a ſerious reformation, as well of literature and manners, as of faith and notions. We ſee, how ſeverely he inſtituted the lives of princes, diſſuaded their raſh wars, rebuked the inſolence of prelates, detected the hypocriſy of indulgences, fiſh-devotion, and plundering beggary. Laſtly, we ſee, how ſtoutly, on the one hand, he confuted the fopperies of the Roman friers, and, on the other hand ſtrangled the confidences of *Luther* and his followers, his *ſervum arbitrium*, *effete faith*, *&c.*

SIR, he deſerves our records, and eulogies for this peculiar remark, that in all his immenſe volumes he did not let fall one line in applauſe, or in defence of thoſe notional phyſico-logics, which are now exterminated by the brightneſs of your experiments. Neither was it poſſible, that he could have done ſo much, and ſo well, if he had ſuffered himſelf to be ſeduced out of his way by that *ignis fatuus*.

AND yet (more to our purpoſe) we may remark, by what expedients he became ſo voluminous, and by what conduct ſo effectual: truly by flying all abroad in ſmall parcels, almoſt in ſingle ſheets. And this was the only poſſible way to write and publiſh ſo much, and yet to live ſo long. Yet his age was not great, and that was interrupted and contracted by the two horrid tormentors, the gout and the ſtone.

SIR, if you caſt your eye upon his own catalogues, either that which he collected at the requeſt of Dr. *Botzheme*, Cal. Feb. 1524; or that which he ſent to *Hector Boetius*, the Scotſman, not long before his death (he died July 11, 1536) you will there ſee, that generally a dozen or a ſcore (ſometimes half a hundred of his printed books) make not ſo much in bulk as ſome one of your elaborate volumes; beſides that his writings are for the moſt part extracts, or ſpun out of the workings of his own ſpirits, or deſcants upon others writings; your's are coſtly, laborious, and ſearching experiments, all of freſh inventions.

HERE you may behold the odd cauſe *Naudæus* had to enroll this voluminous man amongſt them, that have acquired the greateſt ſplendor, and glory, by ſmalleſt enchiridia, and gives him amongſt others the eulogy of *Cornelius Gallus*:

Nec minus eſt nobis per pauca volumina famæ,
Quam quos nulla ſatis bibliotheca capit.

He deſigned and ſent out ſmall parcels, and time and opportunities made them large and many.

THE biggeſt of *Eraſmus*'s volumes are his Adagies, and his Notes on the New Teſtament, and his Paraphraſe, as big as the former; yet theſe did abundantly oblige, and inſtruct, as they were firſt ſpread all abroad in ſmall parcels, the Adagies ſtill encreaſing as faſt as the former editions were ſold off.

ERASMUS perſonates an objection againſt himſelf, and provides you an anſwer, if henceforth you ſhall think fit to embrace his example.

Porro quod quereris exhauriri loculos, quod eundem librum cogaris identidem emere, ita rationem apud te ineas. Finge nunc primum prodiiſſe proverbiorum opus, ac me protinus ab opere vulgato mortem oppetiiſſe. Num futurum eſſet, ut te pœniteret impendii? —Jam & illud mihi finge, me poſt annos aliquot reviviſcere, ſimulque opus idem mecum renaſci melius, ac locupletius, utrum deplorares diſpendium, an ſimul & amico, & amici monumento gratulareris! Jam ſcio quid dicas, redivivo quidem gratularer, at non eſt quod fingis. Utrum igitur tu judicas felicius, a morte reviviſcere, an non mori? Si gratulareris redivivo, multo magis gratulare ſuperſtiti. Poſtremo, ſi poſtrema editio nihil habet novo pretio dignum, liberum eſt non emere; ſi habet, lucrum eſt, non diſpendium. Si prior editio fructum attulit tantilla pecunia dignum, & ſi poſterior idem facit, nimirum auctus es gemino lucro, non mulctatus es damno. Imo quemadmodum ipſi hoc ſemper agimus, dum vivimus, ut nobis ipſis reddamur meliores, ita non prius deſinemus noſtras lucubrationes

nes elimatiores, ac locupletiores reddere, quam deſinemus vivere. This is the laſt part of a juſt and full anſwer.

AND he adds, *Quanquam ipſe jam dudum ingenue faſſus ſum me hic indiligentiorem eſſe, quam par eſt, ſed interim alii meâ ſententiâ gravius peccant, qui cum ſint longe doctiores, ſuperſtitione quadam aut nihil edunt, aut ſero.*

SIR, this great example had the ſucceſs to prevail againſt all the national factions in the Chriſtian world, to rouſe up all the idle friers, and to make way for ingenuous literature and truth. And it is apparent, that all the good, that the Jeſuits have, they had it from *Eraſmus.* By him they retained more truth from the Greek fathers, and their doctrines, than from the later ſchool-men, or from *Auſtin* himſelf, or any of the later Romans, or their many orders: and the wiſeſt and learnedeſt of proteſtants do make the ſame acknowledgments for themſelves. See his *Hyperaſpiſtæ.*

Now I crave leave to open the benefits of this kind of conduct, and the reaſons of the ſucceſs, applied promiſcuouſly to all, that is above ſaid.

1. IT is the ſweeteſt entertainment of life, and both a ſpur and a refreſhment to human induſtry, if we give ſpeedy vent to our freſheſt diſcoveries, which will drive on the pen with a grateful impetuoſity, and it will ſomewhat regratify our ſpirits to ſee the ſpeedy reception amongſt the ingenuous.

2. THAT every piece becomes more perfect, as being examined in ſmall parts; and a diamond is eaſier poliſhed, than a rock.

3. AND thus alſo it is made more perfect by the reſults taken upon all other judgments, and by gradual increaſes: the diamond thus grows more ſolid by the aſſiduous increaſe of diſtillations in ſuch leiſure, as may beſt receive firmeſt induration from the ambient air, or penetrating ſteams.

4. IT is dangerous to health, nor can any mortal long hold out to fill up ſuch large and elaborate volumes, as you have already publiſhed, except he allows himſelf fit intervals, and forbears, till he be carried with the delight and impulſion of his own ſpirit.

5. SUCH due reſts do fill up the ſpirit, and make it more pregnant for the ſublimeſt and moſt excellent inventions.

6. IT is impoſſible, that we ſhould keep our memories firm for our own improvements, if by theſe ſtrong impreſſions, renewals, ruminations, and inculcations, they ſhould not be fortified.

7. THUS we may refreſh our latter days upon our younger delights, which lord *Bacon* recounts amongſt the ſpecial helps to longevity.

8. In all the heaps of miſguiding libraries, you can ſcarce find any other diverſion for your ſpirit, but will be confined to vent, renew, or complete your own. You have only *Des Cartes,* Lord *Bacon*'s good wiſhes, ſome few honeſt chemiſts, and modern diſcoveries in aſtronomy, anatomy, *&c.* What are all theſe, if compared with one St. *Auſtin* for bulk?

9. IF in ſmall volumes, many would lay hold on the opportunities, and could find the leiſure to tranſlate them into the elegancies of the modern languages, yourſelf ſurviving to be the judge and umpire, whether truly and faithfully tranſlated, and to procure their emendations.

10. EVERY man, that plants vines, or olives, takes delight to ſee the yearly growth of his plantations. You have planted groves of olives and vineyards in all climates. Can it diſpleaſe you, to ſee them proſper and flouriſh every where, and ſome of your own fruit gratefully preſented to you from all places, and their liquor in ſeveral ferments? You would ſoon find a conſtant and perpetual recourſe of all rivers to the ocean. The returns would outrun the ſun and moon.

AND this (as I told you at the beginning) is the due application of the loadſtone for *Potoſi* and *Peru.*

HENCE you will conſult, which of your works, that are publiſhed, are fit to be enlarged, which are compleated, and fit to be tranſlated, not only into Latin, but into the chief modern languages (at leaſt of our neighbourhood) French, Italian, German, Spaniſh; which of thoſe under your hand are fitteſt to go abroad in brief tracts, and in what order they ſhould be conſerved in your fuller tomes.

SIR, after this tedious induction, can you permit me to review your works with ſome reflections to this purpoſe?

THE beſt of Roman orators made uſe of one, that was once his ſlave, to criticiſe and to methodiſe his volumes. And *Eraſmus* made it his wiſh, *Optarem mihi tyronem quempiam fidum, qui hoc mihi vita defuncto præſtet, quod ille ſuo Ciceroni.*

SIR, to you I offer it (as he to his maſter) that you may ſee the danger of truſting to another's ordering of your writings; and that you may conſider the neceſſity of uſing your own judgment, whilſt it is in your power.

1. Into the firſt tome I would collect all your devotionals, that are merely ſuch; as Seraphic Love; the Stile of the Holy Scriptures; Occaſional Meditations, *&c.* whatſoever your ſabbatical meditations do produce. But (to ſay truth) your philoſophy, as far as it contemplates the ſyſtem or frame of the world, as the work of God's hand, and with purpoſe to give God the glory, is the office and liturgy of the old ſabbath, and ſhall be of the everlaſting ſabbath; and, agreeable to the ſong of the angels, as ſome of the ancient fathers have called the 104th pſalm. It is our ſhame, that we have ſo many controverſal books, and ſhallow deductions in the proteſtant churches, and ſo few, that are truly and ſolidly framed to compoſe our ſpirits for devotion, and to allay our diſtempers, and to beget in us the love of God, of our neighbours, a peaceable, contented, and quiet mind.

2. For the ſecond tome, your uſefulneſs already publiſhed is complete and full enough, and very fit to antidote philoſophers with the

preliminary

preliminary demonſtration, or acknowledgment of the architectonical principle.

3. THE ſecond part of the ſecond ſection of Uſefulneſs, I hope, and believe, will make up a third tome.

4. THE Procemial Eſſay, the Sceptical Chemiſt, the Sceptical Naturaliſt, the two Eſſays of Unſucceſsfulneſs, and the Diſcourſe of Improbable Truths, do ſeem proper to be annexed for a fourth tome. And of theſe, the Sceptical Naturaliſt, and Improbable Truths, may come abroad in ſeveral parcels apart, as to the purpoſe we have above ſolicited, in ſmall print.

5. THE Origin of Forms, and Qualities, and the Hiſtorical Dialogues concerning Heat and Flame, if you ſhall pleaſe to ſpecify freely out of your own proceſſes and collections, the ſeveral operations of Heat upon ſeveral objects, and in ſeveral degrees, and after ſeveral admiſſions of air, or intervals of time, and with applications of various kinds of menſtruums, will certainly complete a fifth tome.

6. THERMOMETERS, Hiſtory of Cold, Antiperiſtaſis, and other appendages, with the growing additions, will ſoon enlarge a ſixth tome.

7. THE Eſſays of Salt-petre, Fluidity, and Firmneſs, if you ſhall pleaſe to purſue their adjuncts, moiſture, petrification, and other kinds of induration, *&c.* may ſoon grow to a ſeventh tome.

8. HISTORY of Colours and Light will ſurely encreaſe upon your review; and, I believe, all the ingenious do deſire to ſee the reſt of your experiments on that argument, and the reſult of your judgment upon Mr. *Hook*'s Obſervations, 9th, 10th, and 36th Microgr. and applied in ſome particulars to vegetables, that at leaſt we may have ſome better account than of old, concerning the verdure of graſs, and moſt leaves; the various beauties of flowers, and the changes of fruit in the degrees of maturity, and in relation to ſmell, taſte, or other qualities. And truly (as I ſaid above) I cannot conceive, why you ſhould ſcruple to publiſh poſitively your own apprehenſions of the nature and cauſes of light, and all colours, ſimple, compound, and de-compounded: and it is pity, ſince you have gone ſo far in the main work, but that all, that pertains to viſion, ſhould lie together in one body by your choice and collections: this for the eighth tome.

9. YOUR ninth tome may take in whatſoever you ſhall pleaſe to confer more upon us concerning ſubordinate Forms, Sounds, Odors, *&c.* or other deductions from the figure, ſize, texture, motion, reſt, weight, or ſtate, or affections of matter in general, or in peculiar mixtures; and your notes about Occult Qualities. Here you have a fair field to appear abroad in many ſmall parcels; ſome of them taking up but a week, a fortnight, or a month of your time; and you know there are twelve months in a year for your encouragement.

10. THE Spring of the Air, and againſt *Hobbes* and *Hall*, make the tenth tome.

11. HYDROSTATICAL Paradoxes, and the Appendix Phyſico-Mechanical, make the eleventh tome.

12. WHAT directions you ſhall give us concerning mineral earths, compoſts, or impregnating earths, or ſalts; concerning vegetables, ſenſation, nutrition, or other animal faculties, anatomies, how much they may increaſe, I muſt leave it in the hands of God, and to time, and your opportunities. But here again is a threefold field, or rather paradiſe, for your entertainment in every broken month, and for ſmall parcels; and this may call to your remembrance, the diſguiſes of ſeeds, of living creatures, *&c.*

13. THE pandects, or promiſcuous experiments, do ſeem to promiſe a larger bulk than any of the other. And I would earneſtly diſſuade from publiſhing more than a century at a time; for all the reaſons above rendered, and more eſpecially for the immenſe extent of the importance of a ſmall number of theſe collections in the ſeverity of your choice; and they may eaſily overwhelm an ordinary induſtry, and confound memory. When theſe are in your thoughts, I hope you will ſometimes caſt your eye upon lord *Bacon*'s *Novum Organum*, and give him ſome aid for his kindneſs and ſolicitude. By thirty of your experiments, you may lift his head above the waters, and ſave him from the Lethean lake, as the poets call it.

14. THE fourteenth tome waits for your Arcana.

15. AND I may put you in mind to collect and preſerve ſuch of your letters, as do direct, and ſolicit philoſophy; for upon ſuch records they will do the ſame work every where over and over, and in following ages. It is indeed fit to be a poſthume work, but it requires our ſerious care in your life-time, as we ſee by the ſad examples of the great wrong done to excellent perſons, by after handling; as *Scaliger* and lord *Bacon*, amongſt many others, may juſtly complain. Your own amanuenſis, and your own directions, are the beſt conſervatories of theſe; and you may then expunge and enlarge, as you ſee it of publick conducement. But where are Sir *William Petty*'s duplicates?

I MAY now preſs on my particular requeſts.

1. BE pleaſed to correct theſe my faults by directing your amanuenſis to reduce your works into ſuch order, as yourſelf can approve: for upon the frequent view of them, you will find much more of refreſhment and encouragement, in what you have accompliſhed, than cumber of taſks in your way.

2. YOU know them, that can well tranſlate your Sceptical Chemiſt, and ſuch like, into the German tongue; and ſome of your tracts into good French; and there are ſtore, that will clothe them in elegant Italian, and there is much more than men are aware of in it, to have our light and inſtructions in the ornament of our native language.

3. WHILST I write this, I receive your Frigorific Experiment, numb. 15. which puts me

me to the poet's anſwer, *Qui monet, ut facias.* That Experiment, and your Statical Baroſcope of numb. 14, and the Heads for the Natural Hiſtory, numb. 11, do very well deſerve to be enlarged for peculiar treatiſes; for they are leading and pregnant: and though I think we are now ſure and ſafe of a perpetual progreſs in this philoſophy, yet the diſpatch of it is our comfort; and theſe ſhort eſſays do bring a quick return, and awaken our own countrymen, and our univerſities, the more rouſingly, when, by the benefit of tranſlations, the eccho of reputation comes from the moſt famous of foreigners; which is the only remedy againſt envy, whoſe black tooth ſpares none of the living, till they are turned to aſhes. And this I account the moſt pertinent eulogy, that I can raiſe for the reputation of the Royal Society, and chiefly from your laborioufneſs; that you have given an enforcing example, and a ſpirit to the very Jeſuits to oblige mankind; and have found and ſolicited noble enterpriſes, ſuch as may become their innumerable ſociety, their univerſal commerce, and may engage their inexhauſtible treaſures. To find out the true longitude, to correct all maps of topography, to make the world better acquainted with the heavens, ſtars and planets; with all minerals, terreſtrial concretes, ſimples, vegetables, *&c.* The Socinian frets their conſciences (in ſuch as have conſciences) inwardly; and you call them out to ſhew their faith by their works. *Hoc age.* Sir, you know the hand; I wiſh you could read it, and my heart in it.

J. BEAL.

London, Oct. 31, 1666.

Honourable Sir,

I MISS you here, and deplore my unhappineſs in it. But you are better employed; the Uſefulneſs will ſtop the worſt mouths, that the devil can open againſt us; and will be the beſt apology for us of the clergy, better than a hiſtory, which is yet lazy, and much wanting. Mr. *Glanvill* intendeth ſomething theologically in defence of the emergent providences for the ſeaſon of all ages, and of the gifts of God's holy Spirit for inventions to the benefit of the worthy againſt atheiſts and ſcoffers. And he hath a flowry pen, and may do well, if we can ballaſt him from Origenian Platoniſm and extravagant adventures. To which purpoſe I have given him the trouble of much ſcribble, and ſuggeſtions, both hiſtorical and prudential, which he ſeems to accept of, and profeſſeth conformity: but his genius is apt for ſublime adventures. I conceive very great hopes of Mr. *Parker*, but I do always wiſh, that ſuch juvenile felicities could receive a contemperament for their conduct from ſome, that are better ſeaſoned by longer time. This gives the beſt abilities the benefit of a collegiate ſociety.

SIR, I have moleſted you with many cumberſom and unlegible papers; but I had this encouragement, that they were once for all, and perchance ſomewhat your concernment in the ſucceſs of your wonderful and moſt obliging induſtry.

SIR, I have moved Mr. *Oldenburg* to find a way to uſe Sir *Robert Atkins* the recorder of *Briſtol*, and what means elſe he could to frequent the correſpondence with our American plantations, and more particularly with *New England*, amongſt whom there is ſome fear of God, but too notional in the bulk of wavering creeds. They may grow as we do ſhrink. They are the granary, and huſbandmen for all other colonies. They begin for an univerſity, and by the paucity of ſeducing libraries, and the neceſſity of uſeful and accommodable ſupplies, may be at leiſure to be imbued with our ſuggeſtions. And it is fit to put new wine in new veſſels.

SIR, in your Uſefulneſs I beg your thoughts on the baroſcope, with accounts for the food and breath of life, and yet is unintelligible, neither yet can we particulariſe the gravity, till it be ſtated by the help of your excellent balance. By which at leaſt we may have tables to inſtruct us to aſſume poſitively, how high ſuch air of ſuch weight would aſcend. And when the proportions are taken from ſeveral heights, that are certainly known, and exactly meaſured in the time of the ſame ſtate, we may then ſay, how far it does extend, ſuppoſing the ſpring of air to take the ſame meaſure of liberty of the like diſtance. And as for the expanſion, which air may take, when it is of perfect freedom, it cannot more juſtly denominate the place air, than a drop of ſack can denominate a tun of water wine.

BUT, Sir, I ſhould have more care of your buſineſs, than to give you ſo much trouble. I do always pray for the beſt of God's bleſſings upon all your noble endeavours.

SIR,

your ever obliged,

and moſt affectionate

and humble ſervant,

J. BEAL.

Jan. 7, 1666.

Honourable Sir,

THIS hot and droughty ſummer, you obliged us with a ſpecial and preſent remedy againſt exceſſive heat, for our diet, food, and drink, and other cooling refreſhments. And we have hopes, that out of that rich ſtore-houſe in your dialogue of Heat and Flame, or perchance in your Uſefulneſs, you will furniſh us with remedies againſt cold. This ſharp ſeaſon calls to my mind, that I have ſometimes enquired, 1. What things in nature, or by art, or mechanical contrivance, will retain a warming heat longeſt; or

2. a melting or ſcorching heat. 3. What will continue or maintain fire longeſt. 4. What will moſt eaſily take fire. 5. What will beſt reſiſt it, or not yield, or be conſumed by it. 6. What will quench it ſooneſt. 7. What will conſerve it for conveyance of animal or vital ſpirits, or transfuſions in it, *&c.* And how to apply any of the reſults for accommodations of art, or for medical, or oeconomical, or political uſes, or for philoſophical inſtructions.

AND ſome of this philoſophy I have learned from common practices, and vulgar trades, and it is not eaſy to ſurpaſs ſome of their diſcoveries.

1. I HAVE wondered to ſee joiners uſe leaden pots for their glue, but they ſay lead does retain the heat longer than other metals. It is a cloſe metal, and they do not try golden veſſels. For ſometime I had above 100lb. in gold for my uſual bedfellow, and I did not diſcern nor obſerve what good or hurt it did me for heat or cold. *Cary*'s warming ſtone promiſed a warmth for ſix or eight hours. If it performed for two or three hours, it was of great uſe for ſtudents in their ſtudies, where chimnies may be hurtful, pans of charcoal dangerous. A ſervant might renew them for many from one kitchen fire or furnace. They may ſupply the abſence of a warm bedfellow, or help to ſweat, when that is medical. I find by ſad experience, how hurtful bright fires, and eſpecially of ſtone coal, are to the eyes. But ſince men are ſo fooliſh as to make dogs their bedfellows, as is not unfrequent, they are ſoon taught to keep what place or poſture we pleaſe, to warm the belly, ſtomach, back, legs, or feet, as required. And I am ſo well aſſured of the transfuſion of vital ſpirits by what I have often obſerved, how grandmothers tranſplant the freſheſt roſes of their little bedfellows into their own cheeks, that I ſhould prefer a young, ſound, and merry dog before a ſtone or lead. Mr. *Hartlib* told me of ſtoves made cheap about ten years ago. But the ſudden removal from a warm room to a bleak air, or piercing wind, ſhould be forbidden. Who thinks of building a room (for warmth in cold winter, or for coolneſs in ſummer) over a good ſpring, of which we have ſtore in this town, and millions in *England*; and for a long way I note their ſmalleſt ſtreams to run briſk, and to keep all the banks green at ſome diſtance, and unfrozen in our hardeſt froſts. Sir, on Saturday laſt at four in the evening, it was a very quick froſt, ſeldom greater: I tried my ſmoking ſpring-water taken out of a well at 15 foot deep. In a thermometer of 20 inches it aſcended from the 4th to the 9th. I ſent my man to try two excellent ſprings, the one raiſed it to 10, the other wanted that warmth by $\frac{1}{4}$. In few ſummer mornings it aſcended above 11. My parlour is low and cool, and in very hot weather it aſcended not above 12 there. On Friday morning we had oiſters perfectly frozen, firm ice, not perfectly cloſed. I was glad to have the opportunity to obſerve their poſture for reaſons, which hereafter I may acquaint you. Some I ſtewed, the taſte was not altered, or noting corruption. Some I cauſed to be laid on the ground in a room level with my parlour, both the rooms keeping a coolneſs in ſummer. The froſt yeſterday morning was a very little abated, but then and all this ſpace it did freeze hard, and my thermometer kept the remarks of hard froſts; yet in this room the oiſters were all unfrozen, and full of juice, and alive, and we could not diſcern any change from the beſt reliſh. I thank the neighbouring ſpring for this warmth in thoſe rooms. The ſmoke of that ſpring is not there viſible, but I ſuſpect ſome force of it in damps, and an aptneſs to make my paper moiſt, and to beget moldineſs, and thence I fear inſalubrity and putrefaction, which depreciates the accommodation. I ſhould add, that the ſpring, which in old and common fame is held the beſt, did raiſe the thermometer higheſt; and ſo of the reſt. So that common experience in waſhing and oeconomical uſes ſeemed to give ſome ground to fame.

2. To reſtrain a ſtrong fire, the glaſier's melting iron is well deviſed. The taylor's gooſe not unfit, and does him double ſervice.

3. To retain fire unconſumed, Sir *H. Plats* hath obliged the fueller. And my couſin *Speke* here hath bountifully obliged *Iminſter* and his neighbourhood by a black fat earth lately found in his park. But I never ſaw any parallel to a ſea-weed, which we had in *Cambridge* in the mouth of a barrel of the beſt oiſters. It is like there is ſtore of it. It was ſmaller than peaſe-halm, yet it outlaſted two very great fires of their ſea-coal, burning bright in the midſt of the fire. And by a ſtroke of the tongs it fell into the hearth, jingling like metal. It reſembled red hot iron.

4. THIS enquiry is reſolved by gunpowder, and may do worſe.

5. ASBESTRE of old conſerved the remains of noble bodies in their funeral incineration. Can it be made cheaper, and better applied? We have here very thick and fair cups, which bear the fire very well. I know not, whether China-ware does better.

6. MILK, they ſay, quencheth ſpeedily: poor *London* and all *England* wanted milk from heaven. Seventhly and laſtly, a good big pitcher of the coarſe earthen ware, very well glaſed or leaded, with a ſmall orifice, and well corked, may be ſo ordered, as to carry milk warm from the cow a mile or two. I have too much of this vulgar ſtuff; your ſkill in furnaces and crucibles both promiſe far better things. I hope Mr. *Oldenburg* will ſave you the trouble of reading this.

HONOURABLE Sir, I do always pray for the excellent viſcounteſs *Ranelagh*, her noble daughter, and all yours.

Your moſt humble ſervant,
J. BEAL.

To Mr. Oldenburg.

SIR, I have altered my purpoſe for the ſuperſcription, as in the front, becauſe you alone can read my frozen hand.

Your ſervant, *B.*

Yeovill, Jan. 24, 1666. about 3 evening.

Honourable SIR,

I AM further confirmed, that what I deſired Mr. *Oldenburg* in three letters, each adding to the former, concerning the warming a habitation (or ſome rooms at leaſt) by a ſtream from a tepid ſpring, in the hardeſt froſt, that *England* knows, is conſiderable. For this laſt Wedneſday and Thurſday we have had ſuch tepid or temperate ſpring-like weather, that I ſhould not deſire much warmer of any time, yet in hotteſt or warmeſt time of theſe days, where the ſun had reflections on a wall, my thermometer being alſo free from wind, ſtood at 8½ when at the higheſt. In the coldeſt time of this winter it aſcended ſpeedily from four to ten in good ſpring-water, and perchance it would have aſcended higher, if my man had had the patience to ſtay longer. Then I ſaw a young child dabbling in a bucket of water, and ſtanding in a very bleak and ſharply freezing wind. I bid the child go in to the fire; ſhe anſwered, that the water was warm, and ſhe ſtayed there to keep her hands warm. Thereupon I uſed the thermometer.

1. SOME have ponds in leads on their houſe tops. I gueſs, that a far better uſe may be made of water there, at far leſs charges, if from a tepid fountain it guſhed out there into a ſmall receiver, where without ſtay it were ſwiftly carried for the foreſaid purpoſe.

2. AND if I were not a very ſoft and lazy traveller, I would try what ſprings and waters you have at your Stalbrige, and how far applicable to theſe cogitations.

3. SIR, the laſt affliction, which I gave you, relates in one point to theſe your true thermometers. Many do not know of them, or where to obtain good, and perfect at a certainty. Few are well awakened to apply all the uſes of them. And perchance they may be brought to ſome near approach for a ſtandard, by your experiment of ſal armoniac, or other your aſſiſtances, and an aſſiduous practice in the glaſs-houſe.

4. THEY may have ſome uſe in the tranſfuſion of blood and other liquors, and it will oblige us, if we may be informed, what difference in the heat of blood of ſeveral animals; and of milk guſhing out with the ſame celerity. It will direct you to fit the mixtures of milk, ſpirit of wine, *&c.* And the butchers at eaſy terms may give us the proportion of blood in ſeveral animals, fat and lean, wound and ſick, by weighing them before and after the effuſion, all apart unſeparated.

5. THERE you may try the old fame, whether any or all dead bodies are ſo much more ponderous than the living.

6. POSSIBLY a peacock may grow more weighty ſome days after roaſting, than at firſt by relenting and drawing a mixture. But it is hard to believe, that a peacock will keep unputrified a whole year, (or as ſome have not been aſhamed to deliver) above thirty years, and under ground alſo: ſweet and ſound, as new killed.

St. *Auſtin de civ. Dei.* So *Kivanides* promiſeth.

SUCH animals, as are moſt active, ſtrong, and vigorous, or full of ſpirits, and vivacious, are generally lighteſt in the proportion of their bulk, and (as I take it) have leaſt blood.

7. A CAT is lighter than a whelp or dog of the ſame bigneſs, and ſeemeth to have leſs blood. And Mr. *Hales*, your acquaintance in *Eton*, did attribute as near kindred between a cat and a lion, as between ladies beagles and maſtiffs. You will now ſee, whether blood will diſcover kindreds and affinities in animals at any diſtance.

8. IF my gueſs at weights ſhould hold good, when other preſent indications are fair, and promiſing, we may try a horſe and greyhound by weights, before we part with our money, or adventure for a wager. A very good and well practiſed horſeman did oft-times tell me, that I did hit the right, when I adviſed him to buy a full, ſquat, or well truſſed horſe for the mill, or market, or cart, a ſtrong and firm ſinewed, light, eaſily mounting, and almoſt winged horſe for a ſimple ſaddle, or ſpeed in the race.

BUT I muſt not think of weights, without grief for your matchleſs ſcales. And I wiſh you could give no reſt to artificers, till they furniſhed you in a like kind, whilſt all requiſites are in freſh memory.

9. AND in the ſame breath, I wiſh, that a number of academicians could not put the ſcales out of their hands, till they have given us a judicious hiſtory of light and weighty bodies, I mean the degrees of gravity in ſeveral bodies.

10. SIR, I have advertiſed Mr. *Oldenburg* of ſome books worthy to take up the beſt printing-preſſes, and always to be continued in print, as well for the ſtationer's profit, as to element the younger ſtudents in uſeful knowledge, or to incline their affections for the beſt. I ſhall here mention the moſt perfect and abſoluteſt pieces of antiquity. *Rei Ruſticæ authores Latini veteres, Cato, Varro, Columella, Palladius*, fit to be printed in one of our univerſities, by *Stephens*'s edition. Mr. *Oldenburg* and Mr. *Evelyn* tell me, they have that edition. It is ſo hard to be gotten, that Dr. *Benſon* and Dr. *Fell* were two years inquiſitive to get me one, and then they got none, but that of *Comeline* in *Duck-lane* by mere chance. And this of *Comeline* is ſo falſe, that I cannot often be ſure of their ſenſe. We have an unhappy cauſe, that gives us the opportunity of taking up the preſs, to prevent impertinencies; and thus we may undermine our perverſe accuſers, and make antidotes againſt all the force and witchcraft of their ſeducing principles.

11. THE Royal Society have many acute wedges innumerable, as many as there are implements, utenſils, helps of art, or kinds of arts, and inventions, and the impertinent controverſies are very ſoft and looſe timber. It is no hard work to heal the dog in the manger, or to ſilence the ſnarling. And the ſooner it is done, the ſooner you will be a college,

college, and have reſidents enough to collect and put in order all your noble inſtructions, and whatever comes from abſent members.

12. I READ in the Gazette, that a college in *Seville* in *Spain* muſt yield a hundred perſons yearly, that are ſkilful in the art of navigation. Store of ſuch, in both our univerſities, as teach that art, and all parts of mathematicks, anatomy, chemiſtry, and all your other engagements, would ſoon carry the ſtream there, and deduce a good part of their revenues into the right channels, and then poor ſcholars would bring home to their parents ſome better ſkill, than to prove two eggs to be three.

I HEARD a perſon of honour, and of good underſtanding, highly extol Sir *Nic. Criſpe* for ſome influence in making copperas in *England.* Perchance he conſulted for his own profit, and had not much care for the beſt, or beſt way. **But** when I read in Philoſophical Tranſactions, num. 15. that you could direct the way of making ſal armoniac, though I underſtood not the importance, yet I thought of this applauſe. And I fear you are guilty of hiding ſome hundreds of arts, which would relieve many families, and oblige all his majeſty's dominions at leaſt, as well in times of war, as of peace. I need not tell you, that he that contributeth any uſeful trade, or artifice, buildeth the faireſt hoſpitals.

SIR, much of this had not moleſted you, if I had not thought it within the power of your commands. I preſume it ought to be ſo, and then it puts you to no more trouble, than that word and countenance. I pray God to bleſs you in all your affairs, and in all your relations.

I AM, Sir, your ever importunate, but ever obedient ſervant,

J. BEAL.

I SHOULD note, that on Wedneſday and Thurſday forementioned (being very bright and fair days) my marbles were drowned, never were they wetter, only on Thurſday morning they began to dry, but as the day grew brighter, the marbles grew moiſter, the ☿ near 30 inches high. At three afternoon ☿ began to deſcend, ſkies darkened, wind aroſe.

ON Friday the rain continued long, ☿ deſcended near an inch. Thermometer aſcended to 9½ near the temper of our ſprings, and ſeeming like ſome cooling rain in ſummer. So when it is ſnow on all the hills about us, it diſſolves in rain before it falls to ground here, and more frequently in lower vales. Hence I am emboldened to enquire, whether by your opening of the upper, or nether ſprings, or both, or by ſteams emitted out of the earth by the ſame or ſome collateral and concomitant cauſe, the freezing cold be not oft-times expelled and ſubdued. Upon which queſtion I intend in my next to propoſe a way by your own inventions, to take an ephemeris of all the increaſe and decreaſe of ſprings in quantity of courſe, heat, *&c.* to the minuteſt variations. And this I value above a hiſtory of tides, ſuch as may be eaſily obtained.

Jan. 25, *1666-7.*

Honourable Sir,

I TAKE ſo much delight in the experiment of transfuſions, that I find it my duty to congratulate your care, inſpection, and ſucceſſes in it. And, if it be thoroughly proſecuted, it will ſhew us at a certainty all the proper and acquirable force, and operation of blood, in all varieties of changes, and with all ſorts of mixtures for vital functions, for health, ſtrength, courage, activity, appetite, memory, and all mental faculties. If *Lucullus*, and others, who were prodigal of human blood to feed fiſhes, or for the vain glory of unjuſt conqueſts had ſeen this experiment, it is like they would have made havock of their ſlaves, and innocent mortals, for the utmoſt trials; and perchance the Mahometan, if he ſhould now hear of it, would exerciſe the title of his zeal againſt Jews and Chriſtians, to this collateral purpoſe. To prevent which, if our laws would permit it, we might with more innocence, and with ſome degrees of mercy, ſacrifice notorious and dangerous malefactors upon the experiment, whether tamer blood might not amend their minds, and manners. And perchance it may diſcover a way to redeem lunaticks, and madmen, and the epileptical, ſome from the chains of *Bethlehem*, and ſome from the more cruel handlings of chirurgeons and phyſicians. And I think any ingenious man would rather end his days, than ſurvive his reaſon; and rather die once for all, than have frequent epileptical returns; and would rather expire in a bath, by effuſion of blood, as *Lucan* the poet, and other half-favourites of tyrants did, than to ſuffer all the tyranny of uſual chirurgery. And ſomewhat may be done without charges by the kindneſs of our college-bachelors, to diſcover the cauſes and potent remedies againſt the rot in ſheep, and other diſeaſes in ſwine, oxen, *&c.* We cannot foreſee all the importance, but, certainly, it will amount to a fair volume, a large branch of philoſophy, as inſtructive, as pleaſant, and as wonderful, as ever was publiſhed.

SIR, will you permit me (with ſincere veneration and hearty affections towards you and all true virtuoſi) to harp upon one ſtring, which I had made to grate in your ears many times within theſe twelve years. Thus it is.

ALL mortals have ever been apt to ſtand at gaze, and to admire and applaud the wonder for nine days, and then to enlarge it with falſities; but to let the uſefulneſs die in the womb. We ſee the lazineſs and ſtupidity of all mankind, for two thouſand years at leaſt, in the neglect both of the theory, and of the ineſtimable uſe of the magnet; which teacheth me, both to accuſe human dulneſs, and to attribute ſuch weighty inventions to the immediate inſpiration of God, whoſe providence ordereth

ordereth all diſcoveries for their due times and ſeaſons. And, in theſe days, God hath by your hand ſummoned us to quicken and to enliven the application. This is our duty, and the office of charity.

YET, ſhall I not ſay it, that ſome of your own moſt wonderful diſcoveries do lye dead, or aſleep. Many of your improvements, of the moſt excellent nature, are yet unpractiſed; and we hang up our plough upon a pin, as old *Chaucer* expreſſeth it, as if it were holiday. Your balance of the air lies unſtated, leſs underſtood, and leſs applied, than it deſerves. The freezing of eyes for anatomy, and other organs of ſenſe, unpurſued, or unpubliſhed. And the microſcope had been only a gaze, if Dr. *Wren*, Dr. *Powel*, and Mr. *Hook* had not made the application, and ſtill it may produce a ſecular or anniverſary ſupply for anatomy, and to ſhew the ſurface and intrinſic frame of things within our reach in this globe. The beſt teleſcopes have not examined the cauſe of obſcurity in ſome, and of brightneſs in other of the ſtars of the firſt magnitude, nor the approaches, and remoteſt diſtances of ſtars, and many other viſible evidences pertaining to the ſyſtem of the world, and advancing the glory of the Creator much beyond all former acknowledgments.

SIR, I muſt confeſs, that ſo much is done, and excellently performed, as may claim our higheſt applauſes. But that ear is leſs patient than to allow that diſcourſe. Our preſent taſk is to ſay *hoc age*, as of old in the ſacrifices. And it is my peculiar inclination oft-times to call to your mind, that low things, and much vulgar, are the moſt ſpreading obligations. Unclean rags may make fine paper. And the aſhes of ſtones have lately furniſhed more tables, than all the hoſpitals in the world.

SIR, if you ſay this is a ſufficient apology for ſome lines, which I lately intended for you, with a ſecond and third ſupply in following ſcraps of letters, I ſhall rejoice, that ſuch weakneſſes can proſper in benevolous, and indulgent hands. My ſecond thoughts adviſed me to ſuperſcribe them to Mr. *Oldenburg*, that they may give you no more trouble, than the breviate of his account, or extract. Diſpatch and full communications are the life of the Royal Society, in deſpight of war and *Apollyon*, the grand enemy of all elegant arts, and the deſtroyer of mankind. And if I ſhould not ſometimes preſume upon your patience by ſuch officious offences, I ſhould have leſs need, and you leſs of the habit of granting your pardon to,

SIR,

Your moſt humble, and

ever obliged ſervant,

J. BEAL.

SIR, I do always pray for the beſt of God's bleſſings upon you and the moſt excellent viſcounteſs *Ranelagh*, and all your noble relations.

SIR, I am glad to hear, that you do accuſtom the duke of *York* to afford his countenance to the engagements of the Royal Society, that he may acquire a prompt habitude for hereafter. Perchance it is all the coin the court can ſpare.

January 28, 1666.

Honourable Sir,

I PRAY you ſuffer me (in purſuit of my laſt words) in a rude draught, ſuch as my hand is, which is paſt the uſe of the compaſs, to propoſe a kind of ornament for your two inventions, the baroſcope and thermometer; and, if it ſucceeds, for further purpoſe.

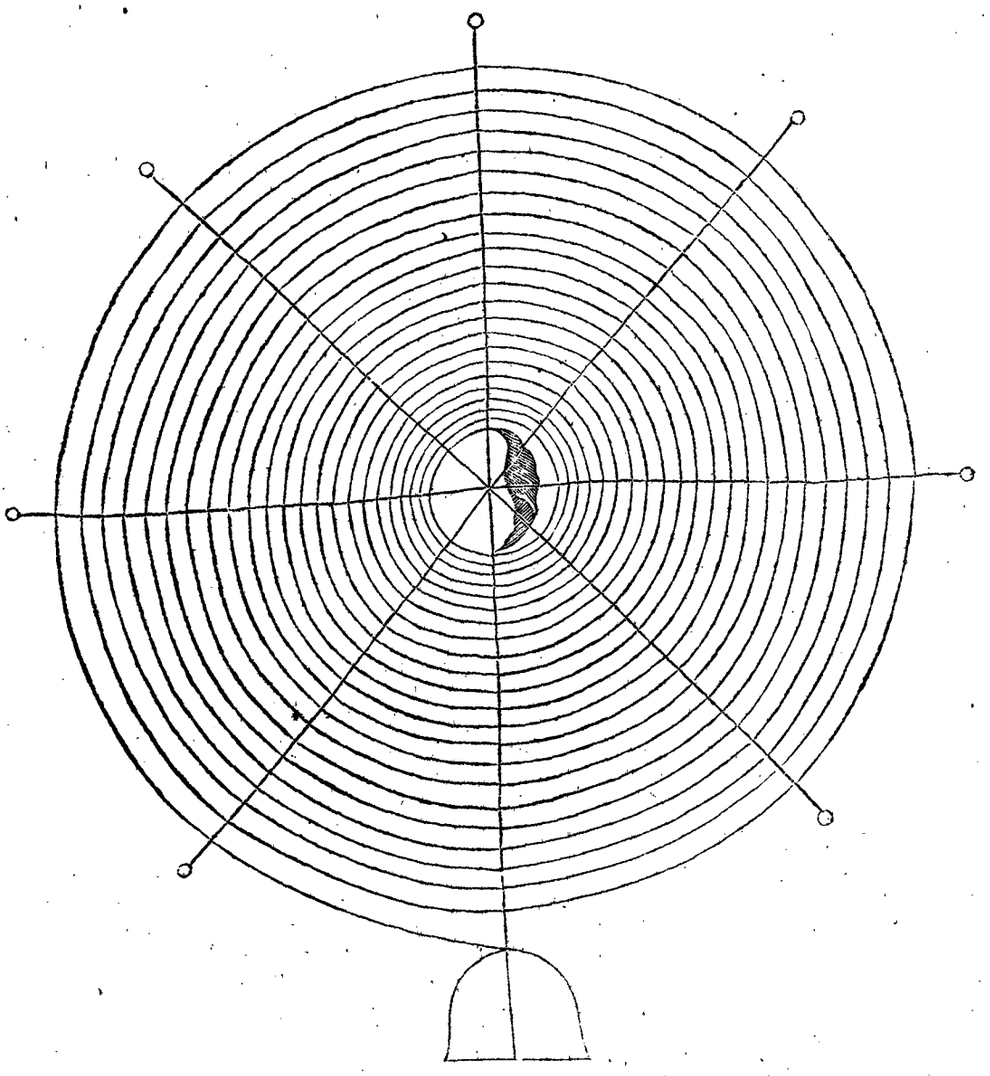
I DO not know, what they can do in the glaſs-houſes; but I have hatbands made of glaſs, ſmaller than the hairs of our heads, and of no great price. Whence I collect, that they can draw the ſtem of a thermometer round to be faſtned on hooks of wire, or wood whipped about with ſilk, or cruel, to ſave them from cracking at every ſmall motion.

IF this can be done upon a frame to the length of forty feet, more or leſs, it may make a baroſcope for lighter liquors, which may take up two or three feet in the changes, and perchance diſcover more fluctuations or trepidation in the air, than a heavier body can do. And to this may be added Dr. *Wren*'s invention for minute variations, mentioned by you in one of Mr. *Oldenburg*'s tracts. But here it is needleſs, and impracticable.

IF the glaſſ-men's ſkill can reach to this; the ſtem being filled in good part, and the bolthead large, and ſo fitted, as an open thermometer, may ſhew to the eye, the reſtleſs changes, and (as I may ſay) the perpetual motion of the air, by variety of heat, cold, weight, even the pulſes of heat. I have a thermometer very inartificially made for nine or ten inches as ſmall as a ſewing thread: when the temper of weather raiſeth the liquor thither, I can never find it at reſt, though I hold my breath, and keep at a good diſtance. If the glaſſ-men cannot perform the utmoſt of my propoſal, yet by this figure they may give a more delicate and nice diſcrimination of degrees of heat, to try, whether ſtrong odours, good or bad, do operate that way. And ſurely they have a motion perpetually, as long as odorous ſubſtance remains. And we want help to diſcover, whether rays reflected from the moon, Jupiter and Venus, have any heat, *&c.*

BUT this figure is proper to ſhew to the eye the indifference of gravid bodies, whether aſcending or deſcending, in ſome caſes. I grant, that the ſame appears in a reverſed thermometer; but here it is repreſented more lively, and more ready at call. In the liquor of one of my thermometers, there fell (in the making) ſome black ſtuff, which ſometimes floats at the top of the liquor, ſometimes deſcends five or ſix inches, or yet more, ſometimes is divided in five parcels, ſometimes in three, frequently in two; but in cold weather is

is always in one, and on the top: yet, in the cool mornings of ſummer, keeps together on the top, when the weather is not near ſo cold (as by the remarks appears) as when it is diſſipated, and deſcend deep in the diſſolving weather, after hard froſts in winter, which proves to me an agitation of the liquor, by the motion of all parts, at the change of weather. The very ſame rules this black ſtuff does obey ever ſince I reverſed the glaſs, which hath been about a year. This may ſeem a double proof, that gravid bodies may as naturally aſcend as deſcend, accordingly as they are circumſtanced by the next ambient. If the bubble, which you mention, could eaſily be fitted for thermometers, the evidence would be to many very acceptable, and give a glimpſe of the ſtate of gravity.



I CANNOT deſpiſe their opinion, who conceive the ſun to have an agency, or ſome influence into the cauſes of the perambulation and rotation (where it is) of the earth and planetary globes. The ruſtics (for their ſport) do cut a reſemblance of a hare, hounds, and huntſman, in cards or paper, which being ſupported, or hung by a peg in a frame *in æquilibrio*, round about the inſide of a lanthorn, will all drive a perpetual round as long as any candle burns in the center of the lanthorn. And in fermentations we do generally ſee a circulation, or ſeveral kinds of boglings, as it were by a mixture of agitations, partly by ſpiral lines, partly by undulations, not mixt otherwiſe than in the motion of ſmoke. And theſe ponderous globes, as they ſwim in the open and wide æther, where there is no real ſurſum or deorſum, but what is relative to our fancy, and where neither air nor æther reſiſts more on any one ſide than on another, may, by the ſolar rays, be whirled about more eaſily, than we are apt to imagine. And perchance theſe globes are not ſo ponderous, as we fancy them to be: we ſee our globe to caſt out her ſails and flags every way in her largeſt and wideſt compaſs; the air, which ſhe emits through all parts of her pulverous or equatic ſurface, hangs in the æther; and the æther and fire, or heat and flame, or other influences of the ſun, do pierce and correſpond ſo deep in the bowels of the earth, that we cannot find the body, that makes reſiſtance againſt them. And perchance this cruſt of the earth, the rocks and metalline ribs, which do faſten this globe in a kind of firmneſs, is of no great thickneſs, or depth, in compariſon of the globe; but may be as the ſhell of an egg, or of an Indian nut; and we do not account an egg-ſhell or the ſhell of a nut ponderous, when the egg is ſucked out, or the kernel taken out. Neither do we yet

diſcover, whether the bowels of this or other globes be ſolid, or repleniſhed with vapours and ſmoking flames. Neither can I ſay, whether a ponderouſneſs or levity would beſt agree with the ſwiftneſs of theſe perambulations. We ſee children do wind their balls hard, and ſometimes about bullets of lead, to make them rebound the better, and ſuch ponderous bodies do take an enforced flight from an exterior impellent ſwiftneſs; but yet the lightning, which carries a light body through a thin paſſage, is ſwifter.

I SEE little reſt in this world; nor can I affirm, that any parts in gold and diamonds are at perfect reſt: their motion may be ſlow and very lazy. And yet again we muſt deny the motion to be very lazy in a like firm and durable ſubſtance, when in hot countries we ſee the diamond or carbuncle always luminous, and, as it were, in a fiery motion. And in all the motions of parts, which we find in the world, I can diſcern no conſtant regard to the Peripatetical center, ſurſum or deorſum.

NEITHER can I affirm, that a ponderous body, deſcending or falling from a tower, deſcends by a line drawn perpendicularly from the circumference to the center: beſides the difference, which may be in the deſcent of moſt ponderous bodies, by the wavings of the air, and which muſt be in bodies pervious to air, and yielding to the ſtroke of winds, all the parts of a deſcending body have more kinds and lines of motion than one. Neither have we ſkill to prove or diſprove accurately, that the lines, by which two ſtones may deſcend at ſeveral diſtances from the ſame tower, are perfectly parallel. But if they are parallel, then the Peripatetical definition of gravity is falſe in that point alſo; and the tendency is not perpendicular. So little can we truſt to our eye concerning the queſtion of the motion or fixedneſs of the earth; and leſs to old fame.

SIR, I have tranſgreſſed, and all theſe ſuggeſtions (for ought I know) may be vain in relation to the thermometer; for I am ignorant of the art of filling them. For the other uſes, a few pounds may do more than is yet done; and when a happy hand is well in, he may in time delight to go on.

SIR, here my main drift was at ſomething elſe: we touch the vein, and attend to the pulſe, to diſcover feverous diſtempers, and languid faintings. Thus we may examine the veins and pulſes of this globe, at their iſſues, ſprings, or fountains: whether in their fullneſs or faintings, in their heat or cold, ſaltneſs, or any bituminous, or other mineral affections, they correſpond with any ſolar, or lunary motion, or operation, *&c.* If the ſpring be ſo ſtened, that it hath no outlet, but at one only orifice; and to the orifice a pipe deviſed of ſeveral ſmall partitions, one higher than another, the loweſt partition carrying the water out fartheſt, for better diſtinction to the eye; this would ſhew, whether the increaſe were mornings or evenings, noon or night, ſpring or autumn. Whether in froſts or diſſolvings, whether fulleſt or freeſt from the ſalt, or mineral, *&c.* By ſuch ways we might chance to find more than we do yet know how to enquire.

SIR, if you can pardon the exceſſes of reſpects and affections, you will pardon this troubleſom officiouſneſs in

your moſt humble ſervant,
J. BEAL.

Octob. 30, 1667.

SIR,

THERE is abundance of polemical writings, which have obtained the mighty titles of theology and philoſophy, and yet are no way conducing to the glory of God, or to the peace or other benefits of mankind; but do much rather beget the frets of our ſpirits, raiſe our emulations and inſolences, waſte our lives and the precious time, which is deſigned and conſecrated to the nobleſt purpoſes. And, till theſe ſpiders cobwebs be ſwept out of our ſchools and temples, our oblations cannot be clean, our holy chalices will be in danger of poiſon.

BUT who dares be the *Hercules* to undertake this bold and toilſom enterprize! Truly, Sir, theſe your antipolemical writings (as they may juſtly be called, becauſe they clear all points, and put an end to many endleſs controverſies) have ſhewed the way for theology, and have performed the main taſk in philoſophy, moſt effectually for us, and for all poſterity.

YOU have for ever expunged and diſmiſſed the firſt matter, old elements, and new and old principles, in your divine Sceptical Chemiſt: and here in your laſt Diſcourſes of Forms and Qualities, you have extricated many labyrinths, and extirpated the very roots and fibres of ſubſtantial forms, and of all diſguiſed and deluding qualities: you have moſt ſolidly laid down the firmneſs of terreſtrials; you have opened the fluidity of liquids, you have meaſured the weight, and examined all the motions, operations, and ſmalleſt particles of air; and fire itſelf (which I may call the knight errant of antiquity) is brought down to offer obeiſance at your command. Sir, you will pardon a poetical alluſion, which is no invention of mine, but as old, and as ſignificant as any Heathen hiſtory. For ſeriouſly, you have not ſuffered the cramps of cold to arreſt us in our dulneſs; nor the velocity of heat, light, or flame to eſcape us. In all which, you have freed the ingenuous from the thraldom of quarrelſom impertinencies, and have purchaſed their leiſure to ſearch out the particulars and excellencies of all nature's bountiful and voluminous diſpenſatory.

But, Sir, my own perſonal obligations are very peculiar and extraordinary. I can only ſigh, and wiſh, that I could prove my ſelf by ſome demonſtration, ſo fully as I am in my heart,

SIR,

your moſt humble, and
moſt affectionate ſervant,
J. BEAL.

Honourable

Yeovill, Oct. 12, 1670.

Honourable Sir,

SOME weeks are paſt, ſince I received from your noble hand a very great favour; ſuch as will oblige all the learned; all that can taſte the lawful and religious delight, which ſhould reſult from beholding the curious and wonderful frame of this our viſible world. It will be my true, but inſufficient excuſe, if I ſay, that it gave me ſuch agreeable entertainment, that I could not eaſily take myſelf off, to render my thankful acknowledgments, till I had four times peruſed the whole, allowing myſelf due reſts and ſeaſonable intervals; and weighing every period, as it were in ſeveral lights; that what was at one time my pomeridian diverſion, was at my next view examined in the morning ſerenity: and this I did with a watchful eye to the malice, that is ſo buſy abroad.

AND now, as far as I have made ſearch into libraries, I muſt pronounce it, and I think I dare undertake it, that theſe and your former writings are the fulleſt and cleareſt interpretation of the divine workmanſhip, that ever yet ſhined in the publick light. And I am very confident, that they will remain for ever, in deſpite of all the oppoſitions, that malice, envy, and bold ignorance can make againſt them. The trifling objections, which depend upon metaphyſical notions, will vaniſh, merely by extricating their terms, which are as changeable, as the moon; or as the French, I ſhould ſay, the Engliſh mode.

BUT, Sir, you will rather hear what I have to offer or propoſe upon any of your arguments. Whilſt a perſon, whom for many years I have known to be creditable, was reading to me the fifth page of your Coſmical Suſpicions, he ſtopped at the firſt period, which mentions peſtilential ſteams; and, before he knew what more was in that diſcourſe, he told me as followeth; "That he knew a good "old woman, aged near eighty, now deceaſ-"ed, who ſaid often, in his hearing, that ſhe "could know, if the plague were within thirty "miles of her, by a pain ſhe had in three "plague ſores, which ſores ſhe had in her "younger days, before ſhe was married." He forgot to aſk, and could not now gueſs, what her particular aim was in mentioning thirty miles diſtance; but her abode was at ten miles diſtance from *Glouceſter*, ten from *Worceſter*, in the mid-way; twelve from *Hereford*, above thirty from *Shrewsbury*; and by her age ſhe might well remember the plague in all thoſe places, ſeveral times, and in many other places within the foreſaid diſtance.

FOR a diverſion, not far out of the way, I ſhall further acquaint you, that when I was a young ſcholar at *Eton*, the town was infected, the ſcholars fled away, my father was deceaſed, my mother at great diſtance, my other relations in court, and I had no addreſs to any: the houſe in which I abode was ſurrounded with the plague, on both ſides at the next doors: the nature and fame of the diſeaſe begot in me a great horror: in this diſtreſs, I had an impreſſing dream, conſiſting of very many particulars: I told all to the family, and within three days we found every circumſtance true, though very ſtrange, and ſeeming caſual. I foretold who were ſent for me, what coloured horſes, and very ſore accidents, which fell on them in the way. From that time to this, I have regarded ſome dreams in myſelf, and others, not without advantage, by the premonitions. I remarked all that I read on that argument, and other preceptions, omens, *&c.* in philoſophy, and in hiſtories, ſacred and profane. I find theſe hints obſerved of old, and with religion, by all nations, Greek, Roman, holy, barbarous; and I cannot ſee cauſe, why they ſhould in later ages be rejected out of the ſchools of philoſophy, or of religion. *Ariſtotle* hath his lecture upon dreams, and *Cæſalpinus*, and many others, refer all the myſtery to emanations: etherial intelligents would make all much more eaſy and more agreeable to the holy ſcriptures, old and new, and to eccleſiaſtical hiſtory. *Mede*, in his profound reſearches, found the interpretation of dreams to be the beſt key to unlock the myſteries of prophecies. Another like hint I ſhall offer. Our famous ſchoolmaſter of *Eton*, Mr. *Buſt*, ſpake ſeldom in the ſchools: I think I remember all that he ſpake, whilſt I was there. At the prophetic verſe of *Orodes* in *Virgil*, he gave a check for ſilence, and then bade us all remark it, that dying men do commonly propheſy. I have had many occaſions to inculcate and really confirm that early advertiſement. *Naudæus in Bibliog. Polit.* pag. 70. thus: *Cum opinio ſit non futilis quidem illa, aut ridicula, ſed omnium fermè gentium conſenſu firmata—— moribundos vaticinari* —— But he expreſſeth it far better with his reaſons, and then adds, *Quemadmodum feciſſe dicuntur Patroclus ab Homero, Orodes a Virgilio, & Poſſidonius a Cicerone, &c. &c. Caſaubon* hath much to this purpoſe, Enthuſ. eſpecially c. ii. p. 59, 60, ſecond edit.

I CONCEIVE the aſtrology of the wiſe and ſober in the Eaſt was not fimbriated with the trifles genethliacal, but attended to new and extraordinary apparitions, and waited for many concomitant hints towards the interpretation, and chiefly by dreams, which were then more conſiderable, when ſkilfully diſtinguiſhed from vulgar, and the ſecret art religiouſly ſolicited by collegiate ſtudies of them, whoſe profeſſion it was to be *ſomniorum & prodigiorum interpretes*; for inſtructions to princes, and for publick utility. *Abraham* hath in oldeſt monuments a great name for the ſyderal arts; and he and his deſcendants made good uſe of the interpretation of dreams: and our primitive Chriſtians aſſure us, that our Saviour's ſtar was a comet; yet whatever other hints the wiſemen had, they had good directions by dreams. Some comets were *blandi*, ſome *horribiles*; and in the firſt ages, when all diſciplines were traditive by experience (without books and babbling) and perhaps frequently from God and his angels, our longevous parents had a long time to regiſter, and compare the

phænomena with the events. If comets were in the firſt ages ſo frequent, as they have been of late, one of thoſe long-lived men might have obſerved at leaſt an hundred and fifty, which number makes a great noiſe for a phyſiological evidence: two or three of our vulgar chronologers being joined together, do number ſixty comets within three hundred years: a diligent cometographer by further enquiry may find out many more in the ſame compaſs of time; and theſe, if they had kept equal diſtance, had been twenty in every century of years, one in every five, and that's no great rarity. But blackneſs or darkneſs within the diſk of the ſun (and without any known eclipſe, and for ſeveral days together, or at leaſt for a longer ſtay than eclipſes can allow) this is a greater rarity; and yet in hiſtory it will occur once in every four or five hundred years. And ſuch portentous ſigns in heaven might juſtly be the blameleſs ſubject of old aſtrology; which, if it had been in *Daniel*'s days (though then perhaps much adulterated) diabolical, or merely ſuperſtitious, *Daniel* ſurely would not have been advocate for the lives, nor the provoſt over the colleges of ſuch aſtrologers. And it is the ſtile of the ſcriptures to threaten judgments by the ſigns of darkneſs in the ſun. This unhiſtorical interpreters turn over to domeſday, which might be the main aim of the prophetical aſpect, but it had always a more literal importance. We may in time hear more of this from the monuments of the Eaſt, when they ſhall be better known to us. Whatever the way, or the manner, or the means of it be, we are ſure, that we have a perception at great diſtance, and otherwiſe than by our known ſenſes; and ſometimes a ſecret anticipation of things future, which cannot be without correſpondence with ſome cauſative, whether aereal, more refinedly ethereal, intelligent, or aſtral; whether by any one or other; or all of theſe expedients, we are ſure of the great and ſtrange effects: and when we ſee, how quickly the ſun-beams do paſs to the borders of this vertex, we may well imagine, that our ſpirits may hold an intercourſe at like diſtance, with equal diſpatch, in mental and ſpiritual affairs.

AND I doubt we are more ſure of the truth, than of the cauſes of the returns in the ſeveral kinds of agues; of the reſort of humours to green wound the third or fourth day; of divers periodical diſeaſes, more than have been hitherto named; of critical days, and of climacterical broodings; I ſay broodings, becauſe I apprehend it, and have deduced it from manifold obſervations, that thoſe years are tender, and by miſconduct fatal; but by ſalubrious applications may revive, and repleniſh the furnaces, and fuel of vital flame; and may redintegrate and corroborate the web of our complexions, and conſtitutions.

SIR, I have many other appendant (and perhaps better and deeper) thoughts, but I have need to beg pardon for this prolixity. And it is time I ſhould conſider, that I ought to prefer the gift you ſent me above a rich medal from ſome great monarch, both for the perſonal reſpects I owe you, and for the intrinſic value. Princes there have been in all ages, and generally they are amongſt all nations; but you are the firſt, and only faithful interpreter of nature, that we have ſeen, or ever heard of: and your diſcoveries of qualities are the golden keys, which unlock the divine cabinets; or I ſhould call them the luminous jewels, which give luſtre to all the parts of our mundane architecture. I beſeech God to reſtore and preſerve your health; and to crown you with the richeſt of his graces and mercies. And I humbly preſent my devoted ſervice to your moſt excellent ſiſter, the right honourable viſcounteſs *Ranelagh*, and her moſt virtuous, and honorable daughters.

SIR,

your ever obliged,

moſt affectionate, and

moſt humble ſervant,

J. BEAL.

Sept. 2, 1671.

Honourable Sir,

I AM obliged in a very extraordinary manner for the honour you have done me, in the favour I received from your noble hand, by the conveyance of our worthy friend Mr. *Oldenburg*. I have now twice read the book over with attention and affection; being all along comforted with ſtrong hopes, that it will revive the Royal Society, to reaſſume their firſt vigour, in defiance of proletary diſcouragements; and ſet many generous perſons at work, to counterpoiſe the emulation, and to ſatisfy the greateſt expectation of foreigners.

DR. *Bathurſt* being our Dean of *Wells*, and now there, I tranſcribed to him out of the fourth tract of the Goods of Mankind, *&c.* Sect. 2. pag. 10. your wiſh, that a catalogue of inventions loſt were extracted out of *Pancirollus* and *Salmuth*, made publick, *&c.* I added, that it were confronted with another catalogue of inventions and accommodations deviſed within theſe two or three hundred years; which is no great ſtride in antiquities; and yet would offer a ſtrange delight, and both would ſuggeſt and prompt inventions for future accommodations, for garments, diet, drinks, all things. Not a row of pins, little clean linen, no ſilken raiments, nor Engliſh beer, within one age, or near it; the trifles would not be thought trifles, if we were now put to ſhift for them. Other places I recited to this purpoſe, that ſuch as have an influence in the univerſities, ſhould inflame metalline ſpirits to bear up the Engliſh reputation againſt foreign inſolence; though perhaps ſome of theſe matters would be beſt performed by ſome generous Greſhamiſts, who may have more aid from the

the great trade and commerce of our chief empory.

I DID not accuſe, but I did tenderly enquire, whether it were true, as is reported, that diſloyal and ſeditious pamphlets were authoriſed in the famous univerſities; and that ſtaunch and reverend heads there were become patrons to a ſacrilegious *Heroſtratus*, and openly courted him with theatrical inſtalment. If all were falſe, I ſhould be the more innocent; if true, *&c. &c.*

To this, and much more, which did ſometimes look like ſatyr, our reverend dean returned me a very civil and obliging anſwer, that the laſt clauſe was a miſinformation, nothing like it, but rather the contrary: that the chief, and even the generality, do abhor the *Bloſius*; and that, when he comes to *Oxford*, more do accompany him in the coffee-houſes, to laugh at him, and to ſcorn his folly and impudence, than to applaud his madneſs: and that a little time may produce better things. This reply from ſuch a ſagacious perſon did pleaſe me ſo well, that I thought it fit to be tranſcribed to you.

BUT I ought not to interrupt you with double pages, whilſt you are ſo active to oblige all mankind, the preſent and future; and to redeem our nation from a great blot. And I can only pray for you, and all your right honourable alliances, ſubſcribing,

Honourable Sir,

your ever obliged and

moſt faithful ſervant,

JOHN BEAL.

Yeovill, Nov. 13, 1671.

SIR,

I SEE, by your favour of 10th inſtant, that you bore with patience, and much more reſpects than I can deſerve or expect, the trouble, which I lately gave you. My reflections did not aim only at your tract of gems, nor yet to your other collections, margined *loco citato*, nor only to Mr. *Hook*'s promiſe, but to the deſign of *Steno*, as far as he hath expreſſed it, and farther; ſince (in my opinion) to explicate the generation of materials, found in the great maſs of the earth, ſome conſideration ſhould be had of terreſtrial rotation; all kinds of motion having ſo much efficiency in the forms and figures of things generated: of which we might expect ſome further diſcoveries, if ſuch as are much practiſed in the deepeſt mines were judicious philoſophers. Sir *William Strode* was to me, as you ſay he was to you, ſomewhat unintelligible; but towards me I could apparently diſcern, that he affected to be intricate; and to amuſe me with wonders; as if he had a mind I ſhould take him to be a conjurer: therefore I ſolicited Mr. *O.* to try, whether his copartner in the mines, Dr. *Cotton*, could explicate his reports in clearer ſtile.

SIR *William Strode* is now, or lately was, in *London*, buſied in a law-ſuit; if he ſhould viſit you, you may have an opportunity to try, whether *Steno*'s prodrome can invite him to apply his obſervations more diſtinctly; and to mind him in my name (if you think fit) of two points. 1. He told me, that in mines for ſome months the fire burns downwards; by which language he means, that it eats or burns the hearth or ground, where it is kindled, deeper than at other times. This he refers to the ſolſtices, but added, that the change was not punctually every year at the ſame time of the months. If the change and difference, as he aſſured, be conſiderable, perhaps it may hint ſome other ſubterraneous motion, or operation, than I am yet aware of. 2. Sir *William* told me of a liquor, which falling from the roof of a mine, did one part immediately petrify, and another part coagulated into the form of milk or cream, very white; a third part ran off in limpid and pure water. Such notes, if true, may be ſignificant to them, that underſtand more than I do; eſpecially, if all circumſtances relating to the roof, place, and fall, be related: how long this liquor runs, or reſts, upon ſtone, *&c.* The former (of fire) was very imperfectly deſcribed to me, and merely deſcribed for my aſtoniſhment.

SIR, I ſhall violate the laws of good manners, and preſume to fill my ſheet (though with trifles) when I adventure to interrupt you.

WHEN I was an *Eton* ſcholar, I broke many great flints, only to obſerve the ſeveral figures interwoven in the mixed veins. In one of many, I found in the very center a marchaſite, not ſeparated, nor that could be divided from the flint; ſince that, I found on the earth elſewhere a flint-ſtone, ſeeming like touch, but harder than the beſt touch. This was only covered on both the flat ſides, with knobs or ſtuds, as big as a pepper-corn cut in half, but with the ornament of angles, ſix or more, of a more golden or fulvous colour, than ever I ſaw any other marchaſite: perhaps, ſome cauſe, more than mere chance, may be rendered, why the marchaſite was on the ſurface of the one, in the center of the other. As my man was digging deep in my garden, he found a heap of white flints, or white pebbles, almoſt tranſparent, one of them, ſomewhat bigger than a two-penny white loaf, was bowed, as if cruſhed, ſo as the outſide ſeemed to be broken through the middle of the ſtone on the one ſide; the cleft whereof was filled with as bright and fair ſtones as any *Briſtol* diamonds, that I have ſeen: it ſeemed to repreſent, how gems may be gotten in hotter countries, or colder, by the contuſions or ruptures of rocks; as I can cruſh cherry-trees and plumb-trees to yield gums in their ſeaſons: but of this I gave notice heretofore. Lately, the blueiſh ſtones, caſt out of a blueiſh marl-pit, being broken, had in the middle many varieties of figures and colours; many of them a white and faintly ſhining ſtone, broader than the palms of my hands every way, and doubly as thick as a crown piece of

ſilver; my man, by breaking many, learned the ſkill to chooſe (aright) thoſe ſtones, which had the white ſtone; he could diſcern a peculiar tumour, or ſwelling, about the middle of thoſe ſtones; upon the flatter ſtones he loſt his labour.

ALAS, what trifles are theſe, in compariſon of what may be remarked by them, that dwell under ground! Yet theſe may be referred to ſome lines in *Steno*'s Prod. pag. 51. Engliſh, where I note, vapours driven out of ſtones, *&c.*

SIR, I ſhall now only add, that Dr. *Bury*, Mr. *Buckland*, Mr. *Gulſon*, and I, with as many as we confer with, are all in an obſtinate hereſy againſt Mr. *Hook*'s publiſhed jugdment, concerning the ſcalops, cockles, and Heliacal ſtones; which we have ſeen with our eyes, half generated, and *in tranſitu* towards generation, and with the breath of our mouths, readily rediſſolvable to their aquatic and terreſtrial principles. We cannot find in our neighbouring ſeas any ſtones or ſhell fiſhes, reſembling any of our Heliacal ſtones; but I fancy, that if the ſoil, where theſe Heliacal ſtones are generated, were covered with ſea water, and *ſub æſtu maris*, (which alternative recourſe may be eſſential to their animation) they would then be enlivened, and amount unto periwinkles (which they do neareſt reſemble) their flatneſs to be turbinated. I cannot diſbelieve all the hiſtories, that I have read of great and monſtrous animals generated in lands, overwhelmed by the ſeas, after the ſeas are drawn off, eſpecially in hot countries. And we ſee, that ſcalops, cockles, and periwinkles, are generated in peculiar places of the ſeas, not every where; periwinkles in our ſhores. It is ſhort logic to infer, that all ſuch are fiſhes petrified, becauſe ſome are brought amongſt us by floods, and here petrified; or to deny the imperfect generation on earth, becauſe we ſee the films, and other reſemblances of marine productions. The Romans, *pro piſcinis*, took care (at vaſt expences) for the ſea tides, as neceſſary for the more agreeable diet of their choiceſt fiſhes: they may as wiſely be conſiderable for generation, without affront to our argument or ſentiment.

BUT, Sir, I have now tranſgreſſed enough, to have need of much pardon; and God knows, who can read, what I have written in the dark, through leathern lamp barnacles.

Honourable Sir,
your moſt humble, and
moſt affectionate ſervant,
JOHN BEALE.

BY the late poſts I have troubled my lady viſcounteſs *Ranelagh* with haſty ſcribbles. I preſent my moſt humble ſervice to her ladyſhip, *&c.*

I HEAR, that excellent marble is digged in a quarry near *Plymouth*.

Nov. 27, 1671.

SIR,

ONCE more I adventure, (becauſe St. *Andrew*'s tide is cloſe at hand) briefly to propoſe, whether it may not be convenient at this next meeting, when the reſort may be greater than ordinary, to nominate two committees of ſuch, as are thought fitteſt, and are willing to correſpond conſtantly, the one committee towards one of our univerſities, the other towards the other. To encourage ſome chief, whom you deem worthy of that truſt, to collect into a club or ſociety ſuch as have a heart and capacities for the advancement of learning; to agree upon ſome place of meeting monthly (ſoftly and ſlowly, rather than too thick and haſty at firſt) there to communicate what they pleaſe of their own, and what they receive from others.

THESE committees may ſometimes oblige by an overplus, which may be ſpared from your repoſitory for theirs; ſometimes by concernments for their Bodleian, ſometimes for their printing preſſes. Every month may afford freſh and welcome arguments. The beginning hath a friendly and becoming aſpect: and if it proſpers to a conſiderable number, and to carry good credit, you may in ſeaſon derive unto them ſome of the power, which by the later additionals to your charter you may lawfully grant. This alone will prevent, that they cannot ſever from you, or make colliſions againſt you, or be independent, or be reputed other than ſubordinate. There you may have your candidates, prepared and eſſayed for your approbation: there are the colleges, revenues, faculties, many opportunities, and leiſure. There in time you may have ſtore of aſtronomers, and other ſons of art, to aſſiſt you in foreign correſpondencies; eſpecially, when by theſe committees they ſhall at all times be adviſed, how they may be furniſhed with the beſt aids, and inſtruments for all ingenious arts.

SIR, you have already publiſhed very coſtly and elaborate volumes, very agreeable and proper for the univerſities, to redeem them from the ſlavery, and perverſeneſs of the mind, reaſon, and all intellectuals; and from impertinent wars about chimeras. By God's bleſſings upon this conduct, you may ſoon ſee the fruit of it, the advance of your labours, as well, and perhaps much more at home, than is yet among foreigners. By this the Stubbian malignity will ſoon be confounded, and extirpated.

AT my requeſt, a young Oxonian prepared me a liſt of fit, capable, and hopeful perſons, addicted to the deſign of the Royal Society, and willing to entertain correſpondencies, and to aſſiſt in them. They ſeemed to me by their qualifications, and number, very conſiderable; ſome in every college, and in every hall. Only in one college, there was but one named; but it is excuſed, that his liſt was much too ſhort, and that he wanted time to complete it, and for ſome reaſons he would not be ſeen to adviſe with others for fuller information. There are excellent profeſſors, ſome lecturers, and very many ſtudents of uſeful arts amongſt them. And in time they may have their meetings in ſome of their publick ſchools, after fit lectures; and the wings of

the Stubbians are already broken, and their reputation withers, as Dr. *Bathurſt* told me. And it will be ſome eaſe and encouragements to ſuch bookiſh men, as I am, when we know, where to offer to farther examination ſuch ſuggeſtions, as we collect from the ancient in our readings; and to ſpread what may be approved, as proper for modern advancements.

SIR, I ſee in the laſt Philoſophical Tranſactions, num, 76. p. 2282. that Mr. *Liſter* is ſomewhat warm on our ſide; and though I reſt not on his argument, which are alſo the ſame here for us, *viz.* that Heliacal ſtones, which Mr. *Buckland* ſent from *Canſham*, are red, as the quarry is there; thoſe, which Dr. *Bury* and Mr. *Gulſon* ſent out of a blueiſh marl pit, are blueiſh and marly: thoſe, which I gathered on *Hambden-hill*, are yellowiſh, as the quarry is there; and one, which I had out of a marl pit here, is greyiſh, another a ferruginous marchaſite. Yet, if they differ not only in the colour, but in many lines and circumſtances of the figure alſo, and no ſuch reſemblances can be found in any ſeas, or on any ſhores, this may add ſome weight to other arguments. The chief of which are to me theſe: 1. That we find them frequently *in fieri*, unfiniſhed and mingled with other ſtones ſome way or other, bearing the quinary, remark noted by *Caſaubon*, Credul. part I. p. 122, *&c.* and other peculiar ſhapes, for which they are here called thunderſtones. 2. Mr. *Buckland* found ſome of thoſe taſed one in another from very large to very ſmall, to the number of ſeventy, as I remember. 3. My credit to various hiſtory, and to the authentick narrative of the *Geneſis*, or creation, as I am taught to underſtand it. I hope Mr. *Liſter* will be deſired to ſend his exemplars, that they may be compared with thoſe, which I ſent up; and that he be adviſed to enquire and notify, what difference of ſhape and figure from each rock. For the colour muſt follow the nature of the ſoil, where they are petrified. When Mr. *Hook*, to convince me, ſhewed me the very film adhering to the inſide of cockles; I anſwered, that I ſhould yet be more confirmed in my ſentiment, if he had ſhewed me ſome of the fleſh, even the vitals. But I wondered moſt, when I was charged of affront to holy text, when I inſiſted upon the expreſs, *Gen.* i. 24. "Let the "earth bring forth the living creature after "his kind, *&c.*" In the creation I conceive there was more diſpatch, than contradiction or oppoſition to the rules and laws of generation. Yet perhaps I was in my younger days affected with the authority of Mr. *Hales* of *Eton*, who, when he ſhewed Mr. *Muffet* on inſects, told me very poſitively, but with a ſmile, that inſects were the new product of every year. And now I know better than he could, that there is as much of divine art and architecture in making an inſect, as a whale or elephant.

BUT I fear I have tired my lady viſcounteſs *Ranelagh* with many other wild matters, and with a touch upon this laſt point of philoſophy concerning Spiders, Caterpillars, aerial Cobwebs; beſeeching your favour to preſent my moſt humble ſervice to her. I may for ſhame make haſte to ſubſcribe,

Honourable Sir,

your moſt affectionate, and

moſt humble ſervant,

J. BEAL.

Yeovill, Oct. 26, 1672.

Honourable Sir,

I SHALL a little interrupt you to diſcourſe of your *Stalbridge*, and your nurſery there. For I hear you have that way alſo a large charity for the publick good of *England*. I have ſent for your nurſery man, that I may ſpeak with him, when he can ſpare a few hours, being myſelf unable to travel ſo far. When you have occaſion to write to *Stalbridge*, be pleaſed to add a line to incline him to accept of my advice; and to confer with Mr. *Henry Star*, a nurſery man of this town, and with *Marmaduke Coates*, a quaker, the chief nurſery man in this county, a neighbour well known, and much uſed by my couſin *Speke*, and by him furniſhed with good ſtore of the right redſtreakes, which my man brought from my lord *Scudamore's* own orchard this laſt ſpring. I have many things to ſay for your man's advertiſement.

AND becauſe I have ſeen your fair and large walls, I recommend to you, and for your man, the Sieur *le Gendre's* manner of ordering fruit trees, printed for *Humphrey Moſely* at *Prince's Arms*, *Pauls*, 1660, written with the greateſt judgment, that ever I ſaw any, after about fifty years experience, and a full knowledge of all the beſt gardens in *France*, tranſlated (as I gueſs by the ſtile) by Mr. *Evelyn*. It is of leſs bulk than the French Gardiner, tranſlated by Mr. *Evelyn*. Both theſe tracts are excellent, but this leſſer is cloſe to the main art, for wall fruit; and his large preface will inſpire a gardner, that hath wit enough to underſtand him. If you pleaſe to mind your man of pear-ſtocks in your nurſeries, and of a trench or two for a nurſery of quinces, mulberries, and vines, I will give him directions, and ſometime ſhew you weighty and urgent reaſons of concernment for publick good, and alſo for curioſity and profit.

BUT my art is chiefly to increaſe a rich winy liquor, and to ſpread the beſt fruit for that purpoſe, as largely over our corn-fields, as the vines are ſpread in *France*, not to countenance tipling, but that we may not be always ſo waſtefully tributaries to *France*, but enrich our vales to have a ſure ſtaple commodity, as our downs now have; and fit for an iſland addicted and concerned for navigation.

I AM told, that in our late war with *Holland*, anno 1665, the French began to interdict trade with *England*, till an accomplice ſhewed their king, that by trade we were penſioners to *France*, merely for their wines,

to

to the value of ſome millions of money yearly. About the ſame time, Mr. *Fortrey*, a gentleman of our king's privy chamber, computes from the Cuſtom-houſe (*et multa cadunt inter calices, &c.*) that beſides all commodities, we export for *France*, the overplus of our expences for their wines amounted to 1600000 l. ſterling yearly: and that this Mr. *Fortrey* publiſhed in his treatiſe of the Engliſh Intereſt and Improvement. I have not ſeen this tract, but I recite it out of Mr. *Roger Coke*'s Treatiſe of Trade, and (to my knowledge) this book was very welcome to ſome of the privy-council. Leſt I ſhould be miſled by falſe printed figures, I examined *Coke*, and found it, p. 3. and again repeated, p. 61. edit. 1. and pag. 39. he adds, that by trading for French wines, in the perilous months of September, October, November, December, we loſe more ſhipping, and more ſeamen, than by all our other trade. And Mr. *Fortrey* calculates, that we loſe in the whole of all our trade with *Spain* for Spaniſh wines 195000 *l.* clearly, which I am ſince informed to be much an undervalue. Thus we are at charges enough to have the French to invade us, and to conquer us, as Saxons, Danes, and Normans have done. Some ſay, that our cyder will ſoon become a drug; I anſwer, that French wine will become odious before the beſt cyder, ſuch as we can already raiſe, will become a drug. Neither did French wine become a drug, when vines did overſpread *France*. I can produce good records, when there were no vines in *France*, nor on the *Rhine*, nor in all *Germany*. Now they are their chief wealth.

AND for further encouragement, I take my wife's word, that ſhe, with others of my family, drank redſtreak at my lord *Scudamore*'s houſe this ſummer, of eleven years old, ſo rich, ſtrong, briſk, and pleaſant, that they took it to be old Spaniſh, or Greek wine, and they came few days ſhort of drinking cyder of ſixteen or ſeventeen years old; richer, as appears in that it was ſpent for the beſt, at my lord's wooing entertainments. And it is eight years ſince my lord's father promiſed me cyder of three, four, and eight years old, the older the better: and my lord's grandfather (at whoſe houſe my wife drank the abovementioned) was a better guardian of rich liquors than my lord's father.

BUT I have found a liquor of pears, richer, and as long laſting for many years trial, as the redſtreak: of this I intend our nurſery men, as moſt proper to be planted alternatively with apples.

I HAVE not yet heard, how the Turgovian pear thrives in *England*. Be pleaſed to review what Mr. *Evelyn* ſaith of it, in *Pomona*, pag. 13. edit. 2. If they thrive, Mr. *Evelyn* is apt (at that motion) freely and generouſly to furniſh you with a few graffs for *Stalbridge*. And thus far I have made bold to trouble you. I preſent my humble ſervice to the right honourable viſcounteſs *Ranelagh*, and her honourable daughters.

Sir, your moſt humble ſervant, J. BEAL.

SIR, if you pleaſe to engage the Royal Society at the anniverſary ſolemnity of St. *Andrew*'s, to continue their care for the propagation of the beſt cyder fruit, in large incloſures of thirty, forty, or more acres, at forty or at leaſt thirty two foot diſtance, that the plough or ſpade may keep the land in hearty tillage; I dare promiſe, that the trees will come on fairer in five years, than in ten without tillage; and bear more fruit, and more frequently abound; and Mr. *Reed* will join teſtimony in this point: naturally good ground is beſt for nurſeries, ſaith *Le Gendre*, upon good reaſons and experience. Not wormy grounds for pear kernels, ſaith *Marmaduke Coates*. The borland and linten pear is beſt for ſtrong perry, *&c. &c.*

Yeovill, March 3, 1672.

Honourable SIR,

I HAVE requeſted my ſtationer *Brome* to ſend you, together with this tract, a ſeaſonable Diſcourſe, ſhewing the Neceſſity of maintaining the eſtabliſhed Religion in oppoſition to Popery. Not as a tract made by myſelf, but very agreeable to my ſenſe; inſomuch, that if I were rich, I would put one in every hand in the two houſes of parliament; and perhaps you will not deem it unſeaſonable.

SIR, many years are paſt, ſince I had the confidence to tell my lord *Brereton*, and others of quality, that (if I did not abhor the wickedneſs) I could myſelf ſmooth and oil the *Roman* pretences, ſufficiently to impoſe upon the main body of a people far more ſagacious than I can find the Engliſh, or any other people in the world to be. For doctrine, I ſhould have good helps from *Picherell*, *Grotius*, *Modrevius*, and a hundred more, ſome aſſiſting in one point, ſome in another; and for diſcipline our own *Hooker*, *Brerewood*, *Hammond*, &c. our very rubricks, canons, and conſtitutions, would furniſh ample grounds; and then I could trick and dreſs up all, to ſhew more liberty than any proteſtants do, or dare afford; and for this laſt, Sir *Edwyn Sandys* in his *Europæ Speculum* (but with an honeſt aim) hath given me ſplendid arguments.

Now at page 6. of this diſcourſe, the oil is quite beaten out of my hand, and all my poiſonous compliments are quite put out of countenance; and by the club law of arguments of intereſt *ad hominem* we are here taught to feel the concernment for the king and people, nobility and gentry, huſbandman and tradeſman, lawyer, and all *England*, to keep off the Pope, with a long pike, at five hundred miles diſtance, if poſſible. To me *England* ſeems weak and haraſſed, out of breath, and out of heart; the proteſtants in all places ſinking apace; the Romaniſts in thouſand guiſes intruding, undermining, inſolent, and already triumphant; and whence is our remedy, when our public ſins cry aloud for publick judgments? In this caſe I would part with cloak and gown, with all accoutre-

ments, ceremonies, and formalities, any thing, to preſerve the ſubſtance.

HONOURABLE Sir, I preſent my humble ſervice to the right honourable viſcount *Ranelagh*, and to all the honourable family, ever remaining,

your moſt humble and
moſt obliged ſervant,
J. BEAL.

Yeovill, Dec. 31, 1673.

Honourable Sir,

I HAVE too long delayed to acknowledge the honour and many great favours, which I have lately received from your noble hands; and particularly your laſt publiſhed volume of Cold, Hydroſcopes, *&c.* Truly I have been very ſick ſome weeks before, and ſince I received your excellent book. And, though it gave me moſt pleaſing treatments, whilſt it was read to me, yet I did long to be my own reader of it to myſelf, before I would adventure to ſay any thing of it to you. And now I muſt complain againſt myſelf, that there is no regard to be had to my ſentiment, or ſentence concerning any of your writings. For as ſoon as any of them appeared, I thought always within my ſelf, that you were at the very bottom, and that nothing could be ſaid more on the ſame matter; yet all the following books have in order ſurpriſed me with freſh, and (as I think) deeper additionals. Your firſt tracts of air were to me as miracles; yet all that followed begot ſtill my greater wonder. I was ſtrangely amuſed at the lazineſs of *aurum fulminans* to take fire and flame at the ceſſation of air; and more, at your performances in rendering fire and flame ponderable. I thought you had ſaid enough and finiſhed for the corpuſcularians in your large and various accounts of particular effluviums; yet your laſt of Cold, of the peculiarity of Air, as to moiſture, and the effects of it, and of Hygroſcopes, do ſeem more largely to diſcover the depth, or to extricate nature, or to direct the great methods for detecting her force, and to apply it for infinite uſes. It is ſtrange indeed, that cold, which ſeems to be the cramp of all things, almoſt a mere ceſſation, ſhould raiſe an expanſive force, as if *aurum fulminans* were fired; and that liquids, in the rage of their conflicts, ſhould beat themſelves mutually into a benumming congelation. Doubtleſs your motions concerning Hydroſcopes will open a fair portal to a main body of deep, uſeful, and pleaſant philoſophy. Sir, you cannot ſuſpect me of ingratitude for any of theſe favours and diſcoveries, whilſt you allow me to be a man of common ſenſe, and of ordinary reaſon. And truly I am, honourable Sir,

Your ever obliged and
moſt humble ſervant,
JOHN BEAL.

I BESEECH you to preſent my moſt humble ſervice to the right honourable my lady viſcounteſs *Ranelagh*, and to her honourable daughters.

I SHALL add a line or two on the back of this.

SIR, I named Mr. *Carew Reynol*'s *True Engliſh Intereſt* to Mr. *Oldenburg* by the laſt poſt. I can ſay nothing to his politicals. But enough may be ſafely done, to make good his great words in the title page. And ſeveral great are done very effectually to the ſame purpoſe, under his majeſty's countenance, and by the happy conduct of the Royal Society. And much more may in good time be done by the ſame proſperous conduct, and conſtant perſeverance, and without any blameable digreſſion from the advance in other points of uſeful knowledge; as myſelf can inſtance for the linen trade, mulberries for the ſilk trade, vineyards, *&c.* And infinitely much more yourſelf do beſt know, and eſpecially in relation to the great trade of *England*. I fear the greateſt obſtructions from the gallants of *Covent Garden*, by their debaucheries, and apiſhneſs. I intend a few lines more to Mr. *Oldenburg*, concerning ſome particulars ſuggeſted by Mr. *Reynol*.

From *Yeovill*, Nov. 29, 1676.

SIR,

I THINK I am as deeply ſenſible of your manifold and great favours, as a man can be. I am ſure your excellent writings do give me all the ſatisfaction, that my own heart can deſire; and much more than ſo; for (to confeſs the truth) they give me abundant ſatisfaction in very many deep and weighty matters, which I had not the capacity to deſire, or to enquire, or to think of. And yet, by my continual indiſpoſition and unluckineſs, I am altogether unable to make any ſhew of gratefulneſs, for you are not a perſon to be complimented with abundance of ſoft words; and I can make no oblation of ſubſtantial importance.

SIR, inſtead of returning you thoſe many thanks, which I am reſolved for ever to owe you, I muſt fall on begging, firſt, that you will pardon a few wild ſheets, bearing the title of Nurſeries, and my name, but (in truth) they are not mine; for they came ſo haſtily from my over-running pen, and ſlipped away out of my power ſo ſuddenly, that they never had one minute of my ſecond thoughts; neither had they blaſted my name abroad, if Mr. *Oldenburg*'s perſuaſions had not prevailed with me more than my own judgment and the ſenſe of my own reputation.

SECONDLY, as bad as the pamphlet is, I beg your honour's countenance, both towards the Royal Society, and towards *Ireland*, not for the pamphlet, but for the buſineſs, to renew and revive their ſolicitations every way towards the publick. Our ſcribbles are but trifles, in compariſon of examples and action

in fit and eminent places; and there is a conduct (as you and many right honourable perſons of your family do well know) which perform more in a year, than huge volumes in half an age; and (to inſtance in the ſmalleſt things, under the roſe) I dare ſay, that *Anthony Lawrence* can do more for propagation of orchards in five years, than Mr. *Auſten* hath done in fifty two years, as he numbers them. Yea, I can prove and ſhew, that he hath done ſo before our eyes very lately, only by tranſporting many thouſands of grafts of apples and pears of the beſt cyder fruit out of *Herefordſhire* and *Worceſterſhire*, into *Somerſetſhire*, *Dorſetſhire*, *Devonſhire*, and *Cornwall*; and by ſending grafts to *London*, and by riding up and down to give inſtructions and encouragements.

SIR, it is more for the reputation of the Royal Society to appear hearty and active in theſe matters, than to let them drive themſelves on, as doubtleſs they will do in time, though but ſlowly, without you. If there were but one or two ſubſtantial nurſeries well begun (as is here directed) in *Oxford*, *Cambridge*, *York*; and in *Ireland*, in *Dublin*, *Cork*, *Limerick*, *Waterford*, *Youghall*, *Galloway* and *Kilkenny*, we ſhould then ſee, what would be done in five years.

SIR, I have under my hand a tract, for which I intend more ſolemnly to addreſs to your honour for countenance: mean while I am haſting to the preſs a fourth Hortulane Letter, addreſſed to Mr. *Oldenburg*, of which the following page will give you the argument; and theſe four are but preliminaries and prodromes to that, which I have already drawn.

SIR,

Your moſt humble ſervant,

J. BEAL.

I HUMBLY crave the favour to preſent my moſt humble ſervice to the right honourable my lady viſcounteſs *Ranelagh*, beſeeching my lady's pardon, favour, and countenance in the ſame affair. I hear, that many worthy perſons in *Ireland* are as forward for garden orchards, as we are. Amongſt them, Mr. *Greatrix*, the healer, is more famous for nurſeries, orchards and cyder.

SIR, when this letter was written, I thought a third letter, which I ſent to *London*, had been printed; which was the cauſe, that the letter next mentioned was by me called the fourth Hortulane Letter. I hope I ſhall yet recover the third.

The cheap and eaſy diſpatch for raiſing, preſerving, and cheriſhing rich nurſeries, and young orchards, and for renewing old and decayed orchards, with more expreſs confirmations of ſome conſiderables intimated in the foregoing Hortulane Letters; this being the fourth Hortulane Letter to Henry Oldenburg, *Eſq; from* J. Beal. *In four chapters.*

CHAP. I. Shewing how ſome by triflings do retard the planting of nurſeries and orchards, and defending the old plain way for ſure diſpatch.

CHAP. II. Shewing ſome plain, ſpeedy, and eaſy ways, how to guard nurſeries, orchards, and gardens from worms, birds, mice, and other noxious vermin; how to prevent or correct bad winds, blaſts, hurtful thunders and lightenings; to purify infectious air; to heal unwholeſom waters; and detecting trifling, ſuperſtitious, and ineffectual pretences, inſtead of true remedies.

CHAP. III. Shewing the moſt expedite and cheap ways of putting forward a young orchard for ſpeedy growth, beauty, and fertility; and how to renew and revive an old, decayed, moſſy, cancerous, and fruitleſs orchard; to be (on a ſudden) freſh, beautiful, and fruitful; at very ſmall charges, or trouble, or with preſent profit, and full reward, whilſt it is doing.

CHAP. IV. Defending more expreſsly the facility of ſetling and maintaining hortulane correſpondencies between theſe triple kingdoms and the Engliſh colonies in America, for exchanging all ſorts of ſeeds, ſets, or plants, together with their proper ſoils yearly.

THIS tract is much larger, than all the other hortulane letters joined together.

For Mr. John Houghton.

Yeovill, Feb. 1, 1680.

Worthy Mr. HOUGHTON,

I INTREAT your patience to hear, how I am rarely ſurpriſed with ſuch noble kindneſſes, that I know not how to prove myſelf an honeſt or thankful man. By our carrier laſt week, I received Mr. *Boyle*'s Aerial Noctiluca, richly embelliſhed with gold and other ornaments, the carrier alſo paid; but not a line or word in the encloſed ſheet, to ſignify to whom I might return my thanks; but I have good reaſon to believe, that it was ſent me by Mr. *Boyle*'s order, for that he obliged me with his many other volumes in like manner richly garniſhed. Therefore I pray you preſent my moſt humble ſervice to Mr. *Boyle*, and let this haſty paper ſay to him, that I cannot but admire the extraordinary ſagacity of the author, and his ſucceſsful induſtry in thoſe reſearches; but I am ſorry, that he was not furniſhed with the beſt preparation of the Bolonian ſtone, and of *Balduin*'s phoſphorus, and of *Kraff*'s two luminaries to ſave him ſome of his pains, and for his further progreſs. We have for ever loſt many rare diſcoveries by the reſervedneſs and mortality of the authors; and theſe Mr. *Boyle*'s ſucceſſes gives us great hope, that in time we may obtain luminaries of great uſe for the general benefit of all mankind. For it appears, that ſome materials may be found compoſed of ſome cold, and more ſparingly ſelf-conſuming ſubſtances. And that, albeit the ſo frequent co-exiſtence of flame and light do beget

get ſome prejudice againſt the attempt; yet is it not ſo much, as that we ought to deſpair of finding within the region of poſſibilities, permanent or long laſting luminaries. Rotten wood, and the tree in *Jamaica*, mentioned by Dr. *Trapham* (of which I hope Mr. *Boyle* hath a fuller account) do afford long laſting luminaries: and ſnow, which ſeems outwardly of a cold complexion, hath ſome degree of luminouſneſs, enough to dazzle our eyes: but ſnow hath ſome intrinſic or circumſtantial heat, as appears by the vegetables cheriſhed and impregnated under it. And Mr. *Boyle* hath given us the demonſtration, how whites do reſiſt ſolar beams, and blacks imbibe them; and Mr. *Newton*'s account of whiteneſs hath evaded the objections of all his adverſaries.

IN a very hot ſummer day, we were eating lobſters at ſupper, which were very pleaſant and ſweet to all that ſat at the table; but whilſt we were ſitting (within half an hour after we had eaten the lobſters) we ſaw the inſides of the ſhells ſhining vividly from the corner of a cupboard, to which they were removed. And Sir *H. Wotton* told me, that after a clap of thunder, cart-loads of ſhell-fiſhes, which they were driving into the town (of *Venice* as I take it) were forthwith driven out, they being well aſſured, that none would buy them after thunder: but thunder ſuddenly taints ſome of our drinks, eſpecially ſweet wort, before the yeaſt or barm is put to it. Whatever becomes of this note, there may be ſomething found uniformly proceeding from luciferous bodies; and of neceſſity every effect muſt be proportionate to its cauſe. If *A* be proportionate to *B*, it cannot be ſo to *C* alſo, *qua* differing from *B*: but in this haſty ſcribble, I wander above my own underſtanding; and therefore it is time I ſhould beg your pardon, and ſubſcribe

Your much obliged,

and very humble ſervant,

J. BEAL.

To Mr. Boyle.

Yeovill, Feb. 16, 1680.

Honourable SIR,

I WAS ſo ſtrangely tranſported, when I received your Aerial Noctiluca, that I could ſcarcely believe mine own eyes, that you ſhould condeſcend ſo low; yet I had good reaſon to believe, that it was ſent me by your expreſs order: for that you have obliged me formerly in like manner with all your volumes; which veracity and ſincerity bind me to acknowledge to be all along the profoundeſt diſcoveries of art and nature, that ever appeared in the world.

SIR, I was tempted to ſend you, by Mr. *Houghton*, an haſty and wild rhapſody of little or no ſenſe; I muſt confeſs I ſent it before I had ſeen more than a very few pages of your book, being interrupted by my function, and viſits of my chief alliances: and now I muſt haſten my recantation; for we could not ſpare you one line or hint, that is in your book. You have explained the terms and the buſineſs ſo accurately, and you have ſo methodically ſtep by ſtep aſcended far higher than I could expect, or imagine; and if you have failed of other men's expedients, though that might coſt you the more trouble, yet it is more to be eſteemed by us, for the variety: and now you have done that, which may purchaſe all other diſcoveries by fair exchange.

SIR, I cannot allow your ſcruple in favour of mankind. Mr. *Hartlib* told me long ſince, how largely, and how often, your bounty hindred *Kuffler* from vending his deſtroying artifice; yet I never heard what hurt or good it hath done, ſince he made ſale of it. All antiquaries agree in it, that our wars have been leſs deſtructive, ſince our thundering artillery, than in former ages: the holy ſcriptures bear full witneſſes to it; and little *Benjamin* loſt more in one day, than all our great monarchs and potentates have done in the main battalia of three years war. For it was but like the hunting of a hare, or of a fox by a wood's ſide: and I have been told, that they have reported the loſs of more men in their ſkirmiſhes, than they have there in battle array. I know not what the French bombs were; but the ſooner they forced a ſurrender, the more lives were ſaved on both ſides. And if brave *Brandenburg* could have forced *Stetin* to have ſurrendred by any terrifying artillery with ſpeed, many lives on both ſides, which were loſt by the long ſiege, might have been ſaved. If *England* ſhould be in diſtreſs, I ſhould pray for ſuch terrifying engines, as would ſoon rout all our enemies: and I wiſh we had ſuch againſt the Moors and Algerines. Therefore I pray do not ſuffer your beſt inventions of defence or offence to die in your hands, but preſerve them for our own day of need. I do conceive, that as the late inventions of printing and navigation were great bleſſings to *Chriſtendom*, for the propagation of the goſpel in our latter days, ſo was alſo the thundering artillery. And as far as I can underſtand the prophet *Daniel*, ch. ii. chap. vii. and *Revel.* ch. xvii. the greateſt work does yet remain, and perhaps may be near at hand; that as thoſe three great expedients have been above three hundred years preparing for the battle of the lamb, ſo God only knows, how many thouſand years may yet remain for the world to enjoy the conqueſt of the lamb.

OF which I have much to ſay ſome other time, for my right honourable lady viſcounteſs *Ranelagh*, to whom I beg leave to preſent my humble ſervice. I pray for you all as my bounden duty.

I AM perſuaded, that the microſcope, as it is now wonderfully improved by Mr. *Hook* and Mr. *Leeuwenhoeck*, and as they are now made by *Cox* and *Mellin*, were by divine providence ordained to accompany your luminous diſcoveries; and that all their important uſes will not be found out in many years. Not that I dare think it fit, that you ſhould be troubled with it; but it is a great damage to the

the publick and to the commonwealth of philoſophy, if you ſhould not have a full college of the beſt ingenious to govern and employ them by your inſtructions; which is all that reaſonable men can expect from you, your hands being ſo full of the nobleſt arguments. I can name at leaſt thirty one admirable volumes, which you have already publiſhed, taking in what I find in Philoſophical Tranſactions, num. 31. and num. 32. and again, num. 62. and num. 63. and num. 132. and elſewhere. And the volumes, which you have publiſhed, do mention about twenty four noble arguments now under your hand, which are impatiently deſired by all, that have hearts for ſolid philoſophy: and I hope, that your Sylva of promiſcuous experiments will be your eaſieſt work, becauſe thoſe you may caſt in at broken hours how you pleaſe; and afterward enlarge them for various importances, far beyond the bulk by marginal references. For we are covetous to be ſecured of all your profound obſervations, and painful labours. Moſt of your publiſhed volumes are alſo rendred in Latin, and ſome of them are enlarged in latter impreſſions.

SIR, upon the by, and partly as belonging to your diſcourſe of Light, I am able to aſſure you, that ſuch darkneſs, as ſeems to moſt men like Egyptian darkneſs, is clear light to ſome animals, and to ſome very few men and women: this I found out, by trying for helps for mine own decayed ſight, and ſince by the experience of ſome few others. Some of my particulars will ſeem very incredible; but I ſhall ſay no more than what I can fully prove. To put a ſtop to this tediouſneſs, I muſt abruptly ſubſcribe,

SIR,

your ever obliged,

moſt affectionate, and

moſt obedient ſervant,

J. BEAL.

POSTSCRIPT.

SIR, I intreat your patience for two advertiſements: firſt our *London* merchants have been always famous for generoſity: they could be now induced to take into their company ſome ingenious virtuoſi to interpret your beſt philoſophy, and to ſhew the uſe of your philoſophical utenſils. I hope they would prove good barter, and then employ our curious operators: but this ſhould be done with all convenient diſpatch, to prevent, that the French, Italians, and Jeſuits themſelves, do not pre-occupate our glory, and turn our beſt artillery againſt ourſelves. If the *Engliſh* pre-occupate, the interpreters may find opportunities to inform the great monarchs, Mahometans, and infidels, that the Jeſuits are interlopers in all trades and traffick by ſea and land; and do infuſe principles for the tripple crown of *Rome* againſt the intereſt of all other monarchs. The monarchs of the *Eaſt*, of *Japan*, and *China*, would not diſdain ſome of your inſtruments. Monſieur *Bernier* tells us, that the great Omrams in the courts of the great Mogul did highly eſteem his new philoſophy, which I think could be no other than that of *Gaſſendus*; which ſince his time is mightily improved, and thus, by God's bleſſing, the light of art and of nature may uſher in the light of grace for the laſt and univerſal propagation of the goſpel; as *Auguſtus* by ſettling peace all over the Roman uſhered in our Lord, the prince of peace, in the firſt propagation of the goſpel. That was begun by blood and ſufferings; this may be more proſperous by the conqueſt of the holy lamb.

SECONDLY, if the miniſters of *New England* can be intreated to print monthly bills of births, male and female, marriages, and burials, male and female, within fifteen miles of *Boſton* and *New Cambridge*, and then once a year to ſend in the like bills from all their colonies, and the iſlands about them; this I conceive would be acceptable to the king, and to all that can make the beſt uſe of Sir *W. Petty*'s notes on the bills of mortality. Sir, this is not to taſk you, but a word from your mouth may probably engage *H. Wood*, or ſome worthy perſon, to preſs it on effectually.

THEY are ſaid to be great breeders, and have lately had ſweeping diſeaſes, beſides their loſs in their late wars: and there are amongſt them learned men to give us a map of *New England*, and their iſlands, as they are now ſettled in peace and plenty; noting in the margin their townſhips, and churches, with other fit circumſtances, taking in *Longland* amongſt their other iſlands. All this may be reaſonably expected from their printing preſs, by the communications of *Boſton* and *Cambridge*.

March 2, 1680.

In Noctilucam viri ampliſſimi ſummique philoſophi, R. B.

EPIGRAMMA.

ÆMULUS en! noſtri ſurgit Britannicus heros;
Noſtraque partitur munera, Phœbus ait.
Non jam de cœlo poſcent ſibi lumina noctes;
I nunc per nemora, & fige, Diana, feras.
O vivat, vigeat longævus, plurima ut ultra
Proferat in lucem ſplendida ſcripta, precor.
Hunc modo parca favens multos conſervet in annos,
Altior humanâ ſorte feretur homo.

HEN. LAVOR, *raptim.*

SIR, this is from our quaker, a man exquiſitely learned in all the arts and ſciences, that are yet known amongſt us; a profound admirer of all your volumes; very reſerved, and of few words; ſo that this is merely enforced from his great reſpects, and ſtrong affections. He gave me epigrams upon ſome of

of your other volumes, which I ſent to Mr. *Oldenburg*, as I received them, in his own hand; ſo that I have no copy.

SIR, you do not allow any ſuch introduction in the front of your other volumes; but I wiſh you would refer it to Mr. *Warr*'s diſcretion, if your *Noctiluca* ſhould come abroad in Latin, to prefix this modeſt epigram for the reader's ſake; *et boni ominis gratiâ.* A fit epigram is an acceptable preparative for the guſt of moſt readers. This is plain and honeſt, and you can indulge affectionate ſimplicity. Excuſe me, Sir, I ſhould be glad to ſee your picture in a curious cut; and the moſt proper epigram, that the beſt wits can make, in the front of every of your volumes, in Latin for your Latin, in Engliſh for your Engliſh. A picture prompts the reader to fancy, that he ſees and hears the author ſpeaking, enlivens his attention, and confirms his memory by the moſt natural impreſſion. I hope you will pardon this over-officiouſneſs, which is not intended to afflict your modeſty, but for the benefit of the readers.

SIR, at the end of my laſt to you, where I wiſh for a map of *New-England*, noting in the margin their towns, churches, and other fit circumſtances; I ſhould have added the natural peculiarities of the place. Yourſelf hath given excellent inſtructions for thoſe purpoſes, in Phil. Tranſ. vol. I. numb. 11. Dr. *Plott*, in his Natural Hiſtory of *Oxfordſhire*, hath done the beſt in it, that I have yet ſeen. And Mr. *Oldenburg*'s Breviate on the ſame, numb. 135, would give good light to *New-Cambridge*. And his preface to vol. XI. ſolicits the ſame; but when he comes to the main point, at the end of that preface, there are ſo many falſe prints and diſlocations, that the ſenſe is paſt recovery. I hope they have all the Phil. Tranſ. in their *Cambridge*. Dr. *Merret*'s Pinax may do them much good. There is an excellent account of the depth of the ſoil from *Barbados*, numb. 117, pag. 399. and a wonderful account from *Bermudas*, numb. 30. pag. 565. I wiſh you had the like from the reſt of the Caribbee iſles, and from *Jamaica*. If *New-England* would now begin it, probably the Engliſh would follow that example in all parts of that large continent, and in the iſlands about it. I have taken ſome pains to find what hath been done in it in other parts of our old world, and have much more to offer for *New-England:* but I have tranſgreſſed already beyond the bounds of a civil addreſs. Sir, I pray for you, and all your noble relations.

SIR,

your ever obliged, and
moſt obedient ſervant,
J. BEALE.

SIR, for ſafety of conveyance, I ſhall duplicate the ſuperſcribed directions.

Yeovill, June 26, 1682.

Honourable Sir,

I HAVE no language to expreſs, how ſenſible I am of my deep obligations for your many great favours; and you have no leiſure for impertinencies. I ſhall only offer to you, at preſent, what I conceive to be of great importance for the publick; and to obtain a free paſſage both for true theology, and for ſound philoſophy.

SIR, all true hearted Engliſhmen, and all good men amongſt us, are aggrieved to ſee the ſwarms and prevalence of Hobbians and Stubbians, atheiſts and ſcoffers, theatrical buffoons, blaſphemers, and the burleſque and traveſtry, which explode all religion, graces and virtues, and moſt of all thoſe heroical virtues, which are the ſtrength and honour of our nation. I dare ſay, theſe have done more real damages and diſhonour to the king, and to our nation, than all the diſſenters in their ſeveral guiſes have been hitherto able to do. And they ſeem to me more dangerous, than all our bloody wars with foreigners, the great plague, and the firing of *London*. Neither can I hear, that God's wonderful mercies upon one of the worſt have been effectual to reclaim the other knights, or the blaſphemous balcony.

FOR a remedy, I have lately tranſacted with one of my beſt friends in ſeveral letters; he deſponds, and ſays, *Conclamatum eſt*, for any thing, that is ſerious, to be heard among the gallants; that it renders a man but ridiculous, to ſpeak there under the rate of dam'me for a preface; and he cannot be a ſtranger to the mode of court, *Exeat aulâ, qui velit eſſe pius.*

SIR, I pray give me leave to abbreviate my arguments to you. We ſee, that God hath in great mercy raiſed a very powerful and commendable clergy amongſt us; at leaſt an hundred excellent ſermons in *London* every ſolemn day; ſome thouſands preached and printed, with other excellent treatiſes of divinity, ſince his majeſty's bleſſed reſtoration. I will name no more, but as our near concernment, Dr. *Tillotſon*'s ſermon at *Whitehall*, on the 2d of *Pet.* iii. 3, where he ſhews, how atheiſm came from *Italy* into *France*, and is now moſt rampant in *England*; and ſhews, how God may forbear his puniſhments in this world for perſonal tranſgreſſions, but is concerned ſometimes to puniſh whole nations for national tranſgreſſions. To this I add Dr. *Parker*'s late Demonſtration, ſhewing how inconſiſtent groſs immoralities are with true Chriſtianity. This book I wiſh were mentioned with juſt applauſe in the Weekly Memorials, that the kingdom may know, that the Royal Society do heartily eſpouſe true and ſolid virtues together with ſerious Chriſtianity. And it would be for the honour of the church of *England*, if their cenſures were as vigorous againſt blaſphemies and rank immoralities, as ſome are for mere formalities; as I ſo lately diſcourſed by the ſeſſions of *Devonſhire*, printed and drawn by baronet *Semour*. The more we are obliged to adventure with boldneſs and reſolution, to encourage the city to advance in arts and ſciences. And we have good grounds to hope, that in a ſhort time, by God's bleſſing, they may be the moſt famous and proſperous empory, that we know of;

being aſſiſted with both our univerſities, which now do heartily concur with them. And it is a good omen, that God hath given them his lively oracles above any other empory; for this, if well received, (as I hope it is by the main body of the city) ſecures them of the bleſſing. And they have already a great number of excellent teachers and writers, and diſciples, of all parts of mathematicks, eſpecially for navigation: and his majeſty hath the firſt honour for endowing a college to teach the art of navigation, which is the great concernment of this inſulary monarchy. Mr. *Moxon*'s charts and mechanicals, and Mr. *Seller*'s furniture for navigation, may be an excellent entertainment for intelligent citizens: and Phil. Tranſ. numb. 24, will ſhew them, how long they have been inſtructed with ſuch aids for navigation, as other parts of the world are not aware of: and yourſelf, in the ſecond tome of Uſefulneſs, have twice told them what you know of the ſkill of ſome urinators. And it is more than ten years ſince his majeſty's urinator, Mr. *Curtis*, publiſhed in the Gazette, how he had practiſed, and was furniſhed with inſtruments divers, and ſhipping, to recover permanent goods, which are loſt by ſhipwreck; which minds me how eaſy it were, and advantageous for our merchants, in all their voyages, to be furniſhed with ſuch urinators; and with the engine, which claws up all the natural and caſual treaſuries of the ſeas, mentioned in Hiſt. R. S. pag. 220, & 248, ſo long ago: and the citizens are by this time able to diſcern, whether they are more obliged to the buffoon, who made it his only buſineſs to vilify virtues and inventions, or to thoſe illuſtrious perſons, who have taken ſo much pains (and at ſo much of their coſt and charges) to increaſe profitable arts and inventions, for the great benefit of the city. I think, no empory hath ſo many, that are expert in the ſeveral kinds of ſhort hands; this requires ſome time and pains to be ſo prompt at it as they are. To perſons of that docibility, the real character may be eaſily taught in a few days, at leaſt to be their own maſters in the practice; and the ſooner, if a ſhort model were printed for an introduction. And the characters, which are vulgarly known for arithmetick, chemiſtry, aſtronomy, and all parts of mathematicks, would ſoon paſs current, with a mixture of Dr. *Wilkins*'s real character for all European Chriſtendom. Many more excellent arts I could add of great worth, which myſelf could teach in few hours, and have practiſed in my younger days. And the citizens, as many of them as can make uſe of a Gazette, may ſoon gain a benefit to themſelves (citizens for their diverſions, gentlemen and virtuous ladies) by reading the beſt books of philoſophy; the Phil. Tranſ. Phil. Coll. and Weekly Memorials, which in their minute half ſheets, by their pleaſing variety, may bore a hole through the thicket of Stubbians. To convince the ſcoffers of their contempt of knowledge, by theſe Phil. Coll. and Memorials, if it ſhall pleaſe God to continue them, we are in a ſure way of furniſhing the city, and all *England*, with the moſt uſeful and moſt wonderful knowledge, that the learned world can afford. The account of *China*, in the Memorials, makes me wiſh, that we had a conſtant correſpondence with them, and they freed from the inhuman Tartars: Mr. *Mallenge*'s microſcope would ſhew them, that the Engliſh have as many eyes as themſelves; and, perhaps, they may aſſiſt us, to improve the teleſcope: and I am perſuaded, that ſhortly it will be much improved, for wonderful diſcoveries in the planets.

O THAT Dr. *Spratt* could be perſuaded to go on with the Hiſtory of the Royal Society! The argument is become much more pleaſant, more hopeful, and the ſeaſon to revive it is perfectly ripe; and no man, that hath the wit to underſtand the excellency of his writings, will adventure to follow him. In pag. 413, 414, *&c.* he hath ſaid enough to reclaim the ſcoffers, if they had been reaſonable animals.

SIR, I wiſh, that Mr. *Erſkine*, and our other Scottiſh virtuoſi, would find out a fit perſon in *Edinburgh* to publiſh half a ſheet weekly, extracted out of the beſt of ours; or as they ſhall be better inſtructed upon the place for the advancement of *Scotland*. My lord of *Perth* will countenance it to his utmoſt, as I am told from a ſure hand. I have caſt in my ſymbol in Phil. Tranſ. numb. 116. pag. 357, and more is for their purpoſe, numb. 124, pag. 583; to which I can add much very peculiar for *Scotland*. It were our happineſs, if we could find them good work at home, rather than that they ſhould be the forlorn hope, or lead the van in all foreign wars, never to return. They are the beſt recruits in the world, frugal, and hardy, fit to recover a good ſhare of the fiſhery upon their own coaſts; or to aſſiſt us in any rough ſervice by ſea or land, and for our napery; and to ſtore our American colonies; which to them would be a paradiſe, in compariſon of their own country. Whites are ſtewards as ſoon as they arrive: but we have moſt need of them for *Newfoundland*, a large and rich territory; and, by right, his majeſty's iſland, but a part of it lately uſurped by the French.

THE like, I ſay, for half a ſheet weekly in *Dublin*, for all *Ireland*; and I do preſume to name Mr. *Conyers*, as fit for the purpoſe, and Sir *James Shaen*, and Sir *William Petty*, who never fails to exceed all expectation; and many excellent perſons of your honourable relations can give life to this buſineſs.

FOR *Boſton*, in *New-England*, where they cannot want fit perſons, nor fit opportunities to diſperſe their prints all over our American colonies, I wiſh they would publiſh a ſheet monthly.

BY theſe expedients (as ſlight as they ſeem) I dare engage, that you would ſoon have thouſands of votaries, and, perhaps, many conſiderable aſſiſtants to affront the atheiſtical ſcoffers: and this is to vere about, in the ſailors phraſe.

SIR,

SIR, I have much more to ſay, but I muſt beg your pardon for this intolerable burthen, which (by the iniquity of the times) we are conſtrained to bear, and to afflict our beſt friends with a ſhare of it.

SIR, I pray for you, and for all your noble relations, particularly my great and conſtant friend, my lady viſcounteſs *Ranelagh*'s, and all her's, and am,

SIR,

your ever obliged, moſt affectionate, humble ſervant,

J. B.

O WHAT a goodly ſight it was to ſee our grandees in the open theatre laugh and grin at the rupture of their own ſolemnly ſubſcribed parole! to prefer a moſt ſlanderous fable with an adulterous maſquerade, which barbarians and ſavages would abhor, in ſuch gibberiſh, as their lacqueys derided, before the ſerious intereſts of all mankind! Gentlemen of honour for Crim Tartars court, grand buffoons! what can the Abhorrers ſay for this? *Eadem fides utrinque.* A nation bewitched, and *Shadwell* the Dramatiſt for the Lancaſhire witches, fitter indeed than for the virtuoſi. I have a Latin iambick for the laureat atheiſts, that may ſave eſquire *Ketch* the labour: it is as ſharp as *in iben*; but where are their contributions? all drowned in the ſame parole? yet it is as good as ſome of their bonds.

P. S. SIR, I wiſh, that ſome of theſe lines in the margin, remark 1, 2, 3, *&c.* were worthy to be entered, *ab incognito*, in the Memorials, where there are good hints for the city, or for the kingdom, and they ſhould be briefly mentioned in the firſt advertiſement of the Gazette. This done three or four times, would make the Memorials paſs as far as the Gazettes, and be more welcome, effectual, and everlaſting. I pray pardon this trifling. The right management of fame is a powerful myſtery, as lord *Bacon* ſhews, in his Fragment of fame. I was once expert at it, by Sir *H. Wotton*'s inſtructions, and it is my main deſign, as the beſt ſtrength of this addreſs; which with better help and good conduct, all the wheels being put into motion, may turn the ſtream, and do much good to many good people, and confound the proudeſt of God's daring enemies, *Deo adjuvante.* God bleſs the promoters.

THE TITLE.

Friendly advices and encouragement for the advancement of London, *and this whole monarchy, in true piety, the nobleſt arts, the beſt culture, and in all the branches of ſound and uſeful knowledge.*

Yeovill, July. 1, 1682.

Honourable Sir,

I HASTEN theſe, to correct a notorious fault in a long letter, which I ſent for you hence June 26th, and to make ſome conſiderable additions, and to beſeech you, if any of my lines be thought fit for the Memorials, to divide them in ſome fit joint, that they may not take up too much room in any one tract of the memorials.

SIR, my great fault was, that I did not do right to Dr. *Tillotſon*; having not ſeen his book ſince it was firſt publiſhed. Having his books now in my hand, I deſire it may run thus——I ſhall only name, as our near concernment, the reverend Dr. *Tillotſon*, dean of *Canterbury*, the firſt vol. fourth edit. printed for Mr. *Gellibrand* 1680-81, where he ſhews, 1. The unreaſonableneſs of atheiſm, and ſcoffing at religion. 2. And recommends religion to men, from the great and manifold advantages, which it brings both to publick ſociety, and to particular perſons. 3. He repreſents the excellencies more particularly of the Chriſtian religion. 4. He perſuades men to the practice of this holy religion. On 2 *Peter* iii. 3. p. 99, in the moſt powerful language, and the moſt moving arguments, he ſaith enough to reclaim atheiſts and ſcoffers, if they were not more ſenſeleſs, and more unreaſonable, than brutes, or ſtocks and ſtones. And on *Prov.* iv. 34. p. 131. he ſhews, that it is the uſual courſe of God's providence, to recompenſe religious and virtuous nations with temporal bleſſings, and proſperity; and, on the other hand, that God many times ſuffers the moſt grievous ſins of particular perſons to go unpuniſhed in this world; but that the general and crying ſins of a nation cannot hope to eſcape publick judgments, unleſs they be prevented by a general repentance. And p. 145. he ſhews, that this atheiſtical humour among Chriſtians was the ſpawn of the groſs ſuperſtitions, and corrupt manners of the Romiſh church and court: that in the laſt age atheiſm travelled over the Alps, and infected *France*: and now of late it hath croſſed the ſeas, and invaded our nation; and it hath prevailed to amazement: that he doth not think, that there are any people in the world, that are generally more indiſpoſed to it, and can worſe brook it; ſerioufneſs and zeal in religion being almoſt the natural temper of the *Engliſh*. So that nothing is to me (ſaith he) matter of greater wonder, than that in a grave and ſober nation, prophaneneſs ſhould ever come to gain ſo much ground, and the beſt and wiſeſt religion in the world to be made the ſcorn of fools——I ſpeak it knowingly (ſaith he) a man can hardly paſs the ſtreets without having his ears grated and pierced with ſuch horrid and blaſphemous oaths, and curſes, as are enough, if we were guilty of no other ſin, to ſink a nation. And this not only from the tribe, that wear liveries, but from thoſe that go before them, and ſhould give better example.

To this I add the reverend Dr. *Parker*, arch-deacon of *Canterbury*'s Demonſtration of the divine authority of the law of nature, and of the Chriſtian Religion: in two parts. Printed for Mr. *Royſton* and Mr. *Chiſwell*, 1681. I do not think there was a fitter treatiſe writ-

ten ſince the apoſtle's age, for our nation, in our circumſtances; ſince pride and prodigality, luxury, and all exceſſes do abound amongſt us, to the utmoſt peril of the city, and of this whole monarchy, as Mr. *Mun* the merchant, like a wiſe and pious Chriſtian, hath demonſtrated fully in his third and nineteenth chapter, highly approved by the wiſeſt of our ſtateſmen, and therefore licenſed in *Whitehall.* Sir, I will ſay no more of doctor *Parker*'s book, becauſe it will take up too much room in the Memorials, to give a full account of it, though in a breviate.

BUT ſince the author of the Memorials ſeems well inclined to give quick touches in behalf of religion, I wiſh, that the *Voice of the Nation* were re-printed in ſmall, that he may give notice in one of his Memorials, of that weighty and invincible argument, that the atheiſm and debaucheries of this nation, above all nations, that ever we heard of, is the moſt likely expedient to introduce popery among us. And I doubt not, but I could ſend a pregnant hint againſt our national debauchery for every Memorial, as long as it ſhall pleaſe God to preſerve my life, who am now entering the 80th year of my age. Sir, I muſt now omit the additions, which I intended as abovementioned. And I pray for you, and for all your noble relations, which have always been my great and ſureſt friends,

SIR,

your ever obliged

and moſt humble ſervant,

J. BEAL.

POSTSCRIPT.

SIR, what I wrote of Dr. *Sprat*, *Scotland*, *Ireland*, and *New-England*, I humbly conceive fitter to be done by the Royal Society, than to be entered into the Memorials; and I have ſomething conſiderable to add concerning the beſt culture, to make good the title at the bottom of my laſt. And I hope by your favour I may paſs incognito, as I have done often by my deceaſed friend, Mr. *Oldenburg*'s favour, in his Philoſophical Tranſactions. And if my letters are too heavy for you, I pray you eaſe yourſelf by referring them, with my humble ſervice, to Mr. *Warr* the elder, that he may ſuggeſt to you what he thinks proper, when he finds you at beſt leiſure.

Yeovill, July 8, 1682.

[I pray firſt ſee my poſtcript in the laſt clauſe of the encloſed paper.]

Honourable Sir,

I SHOULD be now aſhamed to give you this third trouble, ſo ſoon after my laſt of *July* firſt, if I had not met newly with an ugly buſineſs, for which the Royal Society is nearly concerned. For ſome will bid them ſweep clean before their own doors; *medice cura teipſum*; they will ſay the virtuoſi do now publickly declare againſt all the fundamental virtues, and commend prodigality, pride, vanity and luxury, to be for the good of the nation.

SIR, this you may ſee in Mr. *Houghton*'s collection of letters for huſbandry and trade, number 5. pag. 52. line 15. and in the laſt line of that number.

I WROTE to him with as much affection as I could expreſs, and with the beſt arguments of reaſon and divinity, that I could ſuggeſt, to retract it, as a damnable ſentence, contrary to all the hiſtories that I have ſeen, and eſpecially the whole tenor of the holy ſcriptures; and I referred him to Mr. *Mun*'s third and nineteenth chap. where he demonſtrates the contrary, like a religious and wiſe man. Mr. *Houghton*, number 6, p. 59, 60, 61, 62, goes on higher than before, and writes to me, that he had read both theſe chapters, and could find matter enough there, in which he contradicted himſelf, and juſtified Mr. *Houghton*'s ſentiment, *&c.*

SIR, if we take notice of his name, quality, or tracts, we ſhall ſpread the blot wider, but for a perfect cure of it, this I humbly propoſe. When I have ſaid what I have ſaid for doctor *Parker*'s Demonſtration, I will raiſe an anſwer to Mr. *Houghton*'s objection thus —— If it be objected, what will become of our Eaſt-Indian and Turky trade, and other commerce, which I think is almoſt univerſal, if we be ſo ſtrict and ſevere for ſober and Chriſtian virtues; and do not allow of exceſſes in proportion to the largeneſs of our commerce, that we may ſpend the ſtores; which are brought home: to this I will anſwer, firſt, with Mr. *Mun*'s demonſtrations; the moſt judicious (I think) that ever wrote for the foreign trade of *England.* Secondly, I will anſwer with the fulneſs of theological demonſtrations, ſhewing how ſuch exceſſes in pride and luxury (according to the proportions of the increaſing and abounding commerce) have been the ruin and precipitancy of all the greateſt empories, and of all the monarchies, that have ever yet been, and that it ſhall ever be ſo; God having ſo often and expreſly declared it in his word revealed, and in his terrible deeds executed in the face of all the world.

AND firſt I will begin with Mr. *Mun*'s demonſtration, as a ſure remedy to prevent it, and worth millions yearly to *London* and this monarchy, if duly regarded. Chap. 3. pag. 22. A ſtaple or magazine (ſaith he) for foreign corn, indico, ſpices, raw-ſilk, cotton, wooll, or any other commodities whatſoever to be imported, will increaſe ſhipping, trade, treaſure, and the king's cuſtoms, by exporting them again, where need ſhall require, *&c.* Much more there to the ſame purpoſe; and in the ſame chapter, pag. 15, we ſhould ſoberly refrain from exceſſive conſumption of foreign wares, in our diet and raiment, with ſuch often change of faſhions, as is uſed —

which vices at this preſent are more notorious amongſt us, than in former ages, *&c.* Again, chap. 19. pag. 155, 156, 157, 158, 159, and generally throughout that chapter, and in the aforementioned chapter, he charges the Engliſh to be the moſt prodigious waſters and conſumers in the world, to have far outgone the Hollander in the ſwiniſh vice of drunkenneſs; to pull the pot from their noſe, to the great hurt and diſhonour of this famous nation: and much more there, than I muſt repeat. This diſcourſe was addreſſed to the earl of *Southampton*, lord high treaſurer, after the author's death, and highly approved by the wiſeſt of our ſtateſmen; as partly appears, in that it was licenſed at *Whitehall*, March 24, 1663. by the principal ſecretary of ſtate. If thoſe, which were beſt able to judge of theſe matters of ſtate, had diſcerned them, certainly they would not have licenſed ſuch falſe principles, which could have hindered trade or commerce; and how much have our exceſſes, luxury, and debaucheries abounded, ſince this treatiſe hath been written or publiſhed! I ſay nothing to hinder the ancient hoſpitality of the city, nor the decency of their apparel, nor the great variety of liquors or drinks, partly hinted in the Weekly Memorials, number 21, pag. 115, 116. But that our exceſſes in any kind ſhould go ſo much beyond the exceſſes of *Rome*, *Madrid*, *Amſterdam*, or any empire, that we can hear of. This brings us back to the juſt reproach of ſurpaſſing the effects of the Romiſh ſuperſtition and fopperies, in the worſt and moſt dangerous vices, which a reverend perſon ſaid before were in former days the ſpawn of the Romiſh fopperies.

SECONDLY, for the demonſtration by God's holy word, and deeds, that ſuch exceſſes are the ſure fore-runners of the ruin and precipitancy of the greateſt cities and monarchies in the world, from the beginning until this day, I will only refer to a ſermon preached to the houſe of commons, Nov. 13, 1678, by the reverend Dr. *Stillingfleet*. That excellent ſermon is wholly engaged in thoſe proofs, eſpecially from pag. 17, ſecond edition.

SIR, I am ſo large, with a great deſire to make this buſineſs clear and ſure; and I wiſh again, that the *Voice of the Nation* may be re-printed again in ſmall, ſuch ſtore of them, that ſome of them may be ſtitched to the memorials, and diſperſed throughout the kingdom, only mentioned (according to the purport of it) in the memorials.

SIR, I have many more remarkables of quite another nature, which ſeem to me of ſuch importance, that they do lie heavy upon my ſpirit, and conſtrain me to ſtir every ſtone, and to trouble my beſt friends to make them paſs current.

AND by my infirmities I am conſtrained to dictate extempore, and do want a friend to aſſiſt me. I intreat, that *Whitehall* may not be mentioned in any of my lines, nor any word, that ſeems to reflect upon the place, nor the word gallants; I confine my expreſſions to Hobbians and Stubbians, atheiſts, ſcoffers, blaſphemers. Where I ſay of doctor *Tillotſon*, that he ſaid enough to reclaim all the ſcoffers, which are not more ſenſeleſs, it ſhould be thus; which are not as ſenſeleſs and as unreaſonable, as brutes, or ſtocks and ſtones. There are other errata.

SIR, I ſhall be loth to trouble you again in this kind, but if you pleaſe to appoint your ſervant to direct me, how I may addreſs it ſafely; perhaps I may draw up in half a ſheet the right managery of fame, as I was inſtructed by Sir *H. Wotton*, and have by frequent trials found it more ſtupendouſly effectual, than myſelf could have imagined. If *London* had a great fault, and had no ears to hear (as I had prepared all the great reſorts of the city) by veering about, firſt to remoteſt cities, having God and a good cauſe on my ſide; I could make the check come thundering into the city, that they ſhould all take it to be *vox Dei, non hominis*; and make the eccho continue as long as I pleaſe, or revive it when I pleaſe, without any the leaſt danger to myſelf, or any others.

SIR, I beſeech you, give my moſt humble ſervice to the right honourable viſcounteſs *Ranelagh*, and yourſelf to accept of the ſincere devotion of

your moſt obliged

and moſt humble ſervant,

J. BEAL.

WE ſee, that God hath been gracious and bountiful to us, above many other nations, in preſerving and bleſſing us with peace and plenty, with a univerſal commerce, and with a great advancement in uſeful arts and ſciences, in manufactures, mechanicals, and all ſorts of good culture (of which I have much to ſay hereafter:) and now we ſhould be notoriouſly ingrateful, if we ſhould abuſe God's graces, mercies, and bounty, with pride, luxury, and wantonneſs, whereas we are the more bounden to give God the glory by our true humbleneſs and ſuitable induſtry. And this is a good leſſon, and Mr. *Mun*'s book a moſt excellent book, as well for *Dublin*, as for *London*; that they may not ſtrive, which ſhall exceed the other in pride and vanity; which (if it be not prevented) threatens a ſudden ruin to us all.

WE may get nobler employment, than to glory in gay clothes, to enſlave ourſelves to French faſhions, and to pay monthly penſions to French taylors; to obey the precepts of *Heliogabalus*.

Eat, drink, and play, whilſt thou art here,
For death invites to no good chear.

And to imitate *Tricongium*, who had his name for drinking three gallons of wine at one draught, *ſupernaculum*, as good fellows call it.

BUT thrice happy *Scotland*, which was never infamous, or blamed for extravagant apparel, and effeminate toys. Their thiſtle, a wild one (for it is no artichoke, which is a civil thiſtle) with the old motto, *Nemo me impune*

impune laceſſit, hath been long ſince ſo conſiderable, as to oblige the Engliſh roſes and the French lilies, and hath been conſtantly, and is, to this day, for truſt and valour, guardian to the French king in all his glory. As poor as he is, he is able to purchaſe both the Indies, when he pleaſeth, by the royal fiſhery, which attends on their coaſts, and all their iſlands; and to ſecure *Newfound-land* and the Bank (the marvel of the ſea) to the intereſt of this monarchy; and to recover queen *Elizabeth*'s whale-fiſhing in *Greenland*, and to enlarge our preſent whale-fiſhing in *New-England*, *Bermudas*, *&c.* See Phil. Tranſ. numb. 8. pag. 132. and fuller numb. 40. p. 793. and to aſſure his majeſty of enlarging his dominions in the new and old world, both by ſea and land. Thus far, and in many other reſpects, the plain and hardy breeding of *Scotland* is to be preferred before all the preſent delicacies, pride, and exceſſes of *London* and *Dublin*. The genial poet, *Horace*, ſhews how our nobility and gentry ought to be bred.

Carm. lib. 3. ode 2.

Auguſtam, amice, pauperiem pati.

and in a good part of the next following ode 3. Theſe ſhould be tranſcribed, as they are elegantly tranſlated; and *Columella in præfat. omnis enim (ſicut M. Varro)* for thirty lines worthy to be Engliſhed, ſhews, how the Romans, by their ſoft and theatrical breeding, were degenerated, as if he had ſeen how our gentry paſs from the bawdy plays to bawdy houſes, neglecting all good culture, and their ancient hardineſs. And *Gratius Cyneg.* pag. 17. tells us in elegant verſe,

Nec luxus alios avidæque impendia vitæ,
Noſcant; hæc magno redit indulgentia damno, &c.

about twenty more verſes, ſhewing, how luxury has been the ruin of all monarchies. To this may be annexed Mr. *Waſe*'s accurate tranſlation. Laſtly, Pſalm 1. againſt ſcoffers, and pſalm 14, againſt atheiſts, in Dr. *Woodford*'s paraphraſe, will perfect the old proofs. *Dan. Scargill*, fellow of C. C. Coll. in *Camb.* being ejected out of the univerſity, for profeſſing himſelf an Hobbiſt, made his recantation in theſe words; that this Hobbiſm, or atheiſm, is the accurſed root of all that abounding wickedneſs, perjury, ſacrilege, debauchery and uncleanneſs, in this preſent age. pag. 6. in Great St. *Mary*'s, July 25, 1669. This recantation may eaſily be printed in half a ſheet; and then being fairly mentioned in the Memorials, the ſtationer will be ſufficiently repaid, and all the kingdom take notice of the record. We have need to apply all our engines to ſtop, or turn out of *England* this polluted ſtream of iniquity; *Deo propitio, & adjutore noſtro.*

THE young ſtudents of *Oxford* were, by God's wonderful mercy, delivered from the ſame, or worſe temptations, as they were inceſſantly aſſaulted by great wits, of great titles. Now, by God's mercy, both univerſities are raiſed to be juſtly eſteemed the mirror, and wonder of the world, for ſound religion, and for all the moſt excellent arts and ſciences.

THE Memorials do now fill up the whole ſheet, as at firſt; and they ſeem to me to grow better and better, and willing to repreſent religious impreſſions to the beſt advantage.

Sir Robert Moray *to Mr.* Robert Boyle.

October 7, 1661.

My Noble Friend,

THE bearer delivered me yours of 2. in your ſiſter my lady *Ranelagh*'s preſence, where I could neither handſomly read it, nor queſtion him concerning you. I mean to know all he can tell me, when I give him this, and furniſh him what to ſay, when you queſtion him concerning your friends here; only one thing I ſhall ſay for us all, if you did but wiſh us to be with you, as ſtrongly as we wiſh you to be with us, I am ſomewhat diſpoſed to be of the opinion you would draw *Greſham* college to *Oxford*. But I could find in my heart to quarrel with you upon the publick account, of your reſolute depriving us too long of your company, if I had not a ſingular indulgence for you. Therefore I will rather entice you hither, than force you. The king hath been moſt graciouſly pleaſed to grant the deſires in our petition, and you ſhould not be away from the finiſhing what you helped to contrive and promote. We could allow thoſe at *Oxford* any thing with leſs envy, than the fruition of thoſe perſons, whoſe preſence with us can only turn the ſcales on our ſide: but if juſtice alone prevail not to make you haſte to us, let your affection to the promoting of our buſineſs work: and if kindneſs may be allowed any place in the account, remember there is nobody at *Oxford*, nor perhaps any where elſe, hath ſo ſincere and intimate an affection for you, as,

My noble friend,

your faithfuleſt humble ſervant,

R. MORAY.

THE friends you remembered in particular, return your kindneſs heartily. You ſhould not mind of ſo cutting misfortunes, as being out of the way, when you were to ſee me. I know you are not to be charged with forgetfulneſs, and I dare truſt your diſcretion, without ſcruple. Our main buſineſs ſticks ſtill where it did.

To Sir Robert Moray.

Whitehall, July 15, 1672.

TILL now I could not anſwer yours. That which you wrote to Mr. *Aſhurſt* was

was readily anſwered after it was preſented, which was after a ſecond attempt, he having been in the country when the firſt was made: and yeſterday I made out fifty, and delivered it to our friend, from whom I expect a letter to put within this. He knows not yet of any help I had to make out the matter; but that may be help another time. It will now be Friday next before he part. I have this day talked with him pretty fully of all matters, and eaſily prevailed with him, that you and lord *Brereton*, and he and I, and another friend, may confer of the whole buſineſs. I took riſe from his ſhewing me your letter, and the importance of the matter. Therefore I do by all means deſire you may take journey the very next day after this comes to your hands, which I hope ſhall be by to morrow at night; for I could gladly have you here on Wedneſday, if poſſible, that we may have the more time to conſider and talk of things. I did not think fit to tell our friend I had writ to you, though I think you meant my letter, when you told him you had heard of his leaving us; though I will own it to him, when I ſee him next. We have no manner of news more than is in the Gazette, that I know of, worth writing. Haſte hither, and let me know when you arrive. Adieu.

Letters from Dr. John Wallis *to Mr.* Robert Boyle.

Oxon. Dec. 30, 1661.

SIR,

THIS, I ſuppoſe, may be at you time enough to wiſh you a happy new-year; and many more to enſue. It brings with it a part of that in print, which you had before an account of in writing (for it was thought fit by friends that it ſhould alſo appear in this dreſs.) You might have had the whole ere this, had the preſs been as much at leiſure, and as diligent (or rather not ſo much at leiſure, but as diligent) as I could wiſh.

I AM now upon another work; as hard almoſt as to make Mr. *Hobbes* underſtand a demonſtration. It is to teach a perſon dumb and deaf to ſpeak, and to underſtand a language. Of which if he could do either, the other would be more eaſy; but knowing neither, makes both the harder. And though the former may be thought the more difficult, the latter may perhaps require as much of time. For, if a conſiderable time be requiſite for him, that can ſpeak one, to learn a ſecond language; much more for him, that knows none, nor hath ſo much as the advantage of ſpeech.

YOU may think perhaps, that it is not a piece of mathematicks, to teach either ſpeech, or language; as Mr. *Hobbes*, that the attendants of Jupiter were not found out by algebra. But, though I am in this fully of his opinion, yet I muſt in that except to yours, at leaſt thus far, that I find it therein no ſmall advantage to have been verſed in mathematicks.

I WAS the more willing to attempt it, becauſe the perſon was repreſented as very ingenious and apprehenſive (and at leaſt ſo much of a mathematician, as to limn very well, being taught it by ſome of the beſt maſters in *London*.) And I was the more confident, that the defect was not in the organs of ſpeech, (though poſſibly not ſo pliable as in a child, to the forming of unacquainted ſounds) not only upon the common preſumption, that the defect of ſpeech in deaf perſons is but an accidental conſequent of their want of hearing: but alſo becauſe he could once ſpeak (though ſo long ſince, that he does not remember it) till that about five years of age, having by accident loſt his hearing, he thereupon loſt his ſpeech alſo: not at once, but gradually; that is, he was about half a year in loſing it.

HE had, before he came, learned to write, I mean, as an Engliſh ſcrivener writes Greek; of which he knows neither the ſound, nor ſenſe; and thereby hath ſaved me ſo much labour as the teaching him an alphabet. But hears either ſo little, or not at all, that I cannot, as I hoped, make any advantage of it. He cannot from the back-ſide of my houſe, (which is a little more than a ſtone's caſt, and no obſtacle between) hear St. *Mary*'s great bell ring; nor, in *Chriſt Church* choir, hear the organs. Cloſe at his ear he can hear a ſound, but not a voice, (unleſs I ſhould rather ſay he feels it:) I mean, he diſcerns a noiſe, but not the articulation; and of a ſmart ſound, rather than a loud. When, a coach at night ruſhing cloſe by the window, I perceived he diſcerned it; aſking whether he heard it, he ſignified, no, but he felt it, by the ſhaking of the ground.

HE hath now been with me a fortnight, and ſomewhat more. In which time, as to the language, he hath already learned many words, and ſomewhat of the Syntax. And, as to ſpeech, hath pronounced all the ſounds of our language (even thoſe of *L* and *R*; and thoſe of *th* in *thy* and *thigh*, which the French and others complain of as moſt difficult, and can hardly attain unto) which ſecures me, that the organs of ſpeech are not indiſpoſed to the forming of articulate ſounds. And at ſome of theſe he is very ready, though he cannot at pleaſure command them all.

IF you aſk, what my conjecture is as to the iſſue, or what I do deſign in it; I muſt confeſs, that as to the matter of ſpeech, though I doubt not but he may come to ſpeak any thing, yet I do not expect, that he ſhall make the like advantage of it as thoſe, that hear. Becauſe that, neither hearing himſelf nor others, he will be ſubject to forget or miſtake in forming ſounds; and not to correct thoſe miſtakes, becauſe he hears them not. For as one, who knows very well how to write, and hath a good command of his hand, yet if he want either ſight or light, will hardly write well; the like muſt be expected in a deaf man's ſpeaking; for, as then, the eye guides the hand, ſo here, the ear the tongue.

But

But, as to the language, I know not but that he may, by writing, both expreſs his own, and underſtand the conceptions of others, as well as other men; and ſo converſe with men, as we do with the ancients, or perſons diſtant, which is no ſmall advantage in human affairs: and may very much ſupply the defect of ſpeech.

You may pleaſe to acquaint Sir *Robert Moray* with this adventure, (who is himſelf ſo much a virtuoſo, that he is the more inquiſitive what others are doing; and will not allow me to be unimployed:) but whether he will infer, that I am buſy, or, was much at leiſure, I cannot tell. Nor that I further treſpaſs on your preſent affairs, than to ſay, that I am,

Your honour's

affectionate and very humble ſervant,

JOHN WALLIS.

Oxon, May 6, 1662.

SIR,

YOU will excuſe me for not returning you my thanks for yours (ſo full of civility and reſpect) when you underſtand, that I had nothing elſe to ſend with it, that might be worth giving you that trouble: and yet pardon this at preſent, which waits on you with this only addition, that I have thoughts of waiting on you myſelf next week. At which time I may poſſibly preſent you with ſomewhat as acceptable as the laſt, but in another kind. For I ſhall bring with me (I ſuppoſe) a perſon on whom I have made an attempt lately of teaching him to ſpeak, though he cannot hear; wherein your curioſity may poſſibly make you deſirous of underſtanding what progreſs I have made. Which being of ſuch a nature, as not to be ſo ſatisfactory in a repreſentation to the eye as to the ear, I ſhall forbear the narrative, and refer it till you may receive a perſonal account thereof from himſelf, and from,

SIR,

your very humble ſervant,

JOHN WALLIS.

Oxon, March 27, 1663.

SIR,

THE encloſed is in obedience to your commands laid upon me, when I waited on you at *London*. If it be too large, you may extract out of it as ſhort a one as you pleaſe; and if it may ſeem in ought too ſhort, there is ſcope of enlarging it as far as you ſhall think fit. The deſign is ſo ordered as to obviate the inconveniences, and to reſerve as much of convenience as well may be. The other command, which I received in order to Dr. *Pocock*, I have endeavoured to obſerve ſo far as was in me. I acquainted him with your deſire; but he tells me, that to give account of all the longitudes and latitudes in *Abulfeda*, is, in a manner, to tranſcribe the whole book; for it contains little elſe but the longitude and latitude of places, with ſome very brief deſcriptions of them in two or three lines, and not digeſted into diſtinct tables, but to be collected out of the text. But he tells me, that Mr. *Clark* is deſigning ſomewhat out of him and other geographers compared; which perhaps may better ſatisfy the deſire of the gentleman, than a bare account of *Abulfeda* alone. I hoped to have given a ſpeedier account of both, had not ſomewhat elſe ſo often interpoſed. Your goodneſs, I truſt, will excuſe the delay, and accept the endeavours of,

SIR,

your honour's very humble ſervant,

JOHN WALLIS.

SINCE I had written thus much, Mr. *Hyde* (the under-library-keeper) tells me, that if you pleaſe, he will collect out of *Abulfeda* the longitudes and latitudes, and tranſmit to you (I ſuppoſe he will expect ſome gratuity for his pains.) He hath lately, for the biſhop of *Exeter*, tranſcribed out of *Uleg Beig* the longitude and latitude of all the fixed ſtars, according to his obſervations. If you think it *tanti*, and give me ſuch order, I will deſire him to undertake it.

Oxon, Sept. 10, 1663.

SIR,

I HAVE with very great content and ſatisfaction gone through that book of yours, wherein you have ſo very charitably obliged mankind. You will eaſily believe, though I ſhould not tell it you, that in ſo ſhort a time it were not poſſible for me to conſider ſo much variety of good matter, ſuitably to the worth of it. Which though it be true, yet doth not ariſe from want of reſpect to it, but from mine impotence and utter inability to paſs a particular judgment of chemical proceſſes, being ſo nothing of a chemiſt myſelf. And therefore, the animadverſions, which you invite me to make, you may be ſecure, will not concern any thing of that kind. The papers encloſed come ſo rudely, becauſe I could not judge what is in them to be worth writing twice, which I fear you will have reaſon to think not worth reading once. And if after (or before) you have once read them, you will pleaſe to let them help make a fire under one of your learned furnaces, it will be a greater honour than they deſerve. For by that means, they may give ſome light to ſome of your works.

BUT your mention of ſome ſpecificks you have for diſtempers in *genere nervoſo*, minds me of what I thought to have diſcourſed with you, but neglected, when I had the opportunity

portunity concerning ſome very odd and dangerous ſymptoms in a relation of mine (my brother's wife) ſo good a perſon, and ſo uſeful, that her life and health are very well worth the preſerving. In order to which I have tranſcribed the account of her caſe, as her phyſician (a good chemiſt, and ſucceſsful practitioner, the ſame I mention in the encloſed papers) did upon my requeſt draw it up to ſend to Dr. *Willis*; together with what afterwards I did myſelf obſerve. If you have any arcanum, which you judge proper in the caſe, by communicating the medicine (though you keep your ſecret) you will not only do a great work of charity to her, and in her to many more, and very much oblige,

SIR,

Your honour's very humble ſervant,

JOHN WALLIS.

Incloſed in the preceding.

25° Julii, 1663.

UXOR Dom. Wallis Aſhfordienſis, Cant. habitus mediocris, temperamenti melancholegmatici, quadrageſimum agens annum, victu eucbymo ut plurimum utens, ab incunabulis plerumque valetudinaria exiſtens, rariſſimè cum morbo ullo acuto (exceptis variolis) tentata, ſemperque pro ſcorbutica ſuſpecta; poſt varia et innotata ſymptomata leviora, quæ annis præteritis quandoque paſſa fuit, ſub autumni ſuperioris initio, dolore lateris dextri, pleuritico haud multum diſſimili, prehenſa eſt: cui, phlebotomiâ præſidiiſque aliis levibus, pacato, paulatim ſucceſſit dolor acutiſſimus, mordicans et pungens, ſub mucronatâ cartilagine, quandoque ad umbilicum fere, quandoque ad coſtas nothas dextras, quandoque ad ilia dextra ſe porrigens; unâ vel alterâ poſt paſtum horâ delapſâ, ægrotam invadens: quem gradatim ſupervenit oris ventriculi (poſt ſumptum cibum, ut antea) ſuperioris morſus acerbiſſimus, animi fere deliquium ſecum trahens, per circuitus revertens, cum reſpiratione frequenti, et fere interceptâ, oſcitatione, ructatione, vellicatione, et ſæpiſſimè totius quaſi ventriculi convulſione; nunquam illam jejunum invadens, neque poſt ſumptum panem neque frumentacea edulia inhauſta; ſed tantummodo quum victitaſſet carnes fere quaſcunque: unde per totam hyemem, frumentaceo et triticeo victu, vinoque generoſo, contenta remanſit; ſæpiſſime etiam per menſem ampliuſve temporis, tali regimine, immunis evaſit, ſolitis fungens muneribus domeſticis, placideque noctes trahens, ſatiſque hilariter inter vicinos ſe gerens; paroxyſmis prædictis (quando invaſere) magis magiſque ſenſim minuentibus. Vere ingrediente, omnia mitiora facta, prædictis ſymptomatibus in totum fere evaneſcentibus. Ingruente æſtate, corporis illius ſtatus non procul à naturali et eucratico videbatur, eduliiſque quibuſcunque ut placuit veſcens, ſineque moleſtia ferens. Attamen ſub menſis præteriti calce ſubito poſt paſtum paroxyſmo præteritis diſſimili correpta eſt; cum dolore hypochondrii dextri, tum gravativo tum pungitivo, cum frequentiſſimâ reſpiratione, et metu ſuffocationis, febriculam ſecum habente, cum urinis coloratis, anxietate inſueta, ſubitaneoque virium lapſu, ut vix loqui vel ſe de loco in locum movere potuit, loquelâ interim gemitibus inſolitis interrupta, et ſummotam, in ultimum vitæ diſcrimen adſtantibus redacta videbatur, ita ut per plures dies in cubiculo vel lecto ſe continebat, unoque eodemque ſtatu per quinque vel ſex dies permanſit, uſitato interim victu utens uti placebat; ſine appetitus dejectione, ventriculi retentricis vel expultricis vitio, vel coctricis imbecillitate; videbatur autem coctio depravata, ſicque ſe habebant facultates ſtomachi per totum morbi decurſum. Hoc inſuper notandum, quod medicamenta purgantia nunquam ferre poſſit. Nunc temporis, omnia leviora ſunt facta, cibos (uti arrident) capit, ſine ullorum prædictorum ſymptomatum inſultu, vitamque trahit (quam antea) beatiorem, ſine dolore vel triſtitia. Hæc ſunt præcipua, quæ in noſtrâ ægrotâ ſe produnt.

THIS is verbatim the account, which I had from her phyſician (her brother) who had diligently watched her, as you may diſcern by the ſo particular account he gives. Upon diſcourſe with him, he tells me, he had ſometime thought the cauſe of thoſe ſtrange ſymptoms to have been in the coats of the ſtomach (becauſe digeſtion in the ſtomach, and other faculties there, ſeemed not to be much impedited;) ſince that it was rather in the ferment of the ſtomach, but from whence injected (from the pancreas, or whence elſe) was dubious. Her head not moleſted with fumes or aches, nor is ſhe wont to be feveriſh, or otherwiſe (ſave as is related) diſcompoſed. Her ſtomach he complains of as troubled with viſcous matter, or ſuch, as that he can hardly make any medicine faſten on it, which he would willingly move by vomit, but dares not, knowing how deadly ſick ſhe hath been ſome years ſince with that phyſick. Yet once he ventured on a gentle vomit, but durſt not ſtir from her all the while it worked; and is not willing to venture again. And ſometime a pipe of tobacco doth not only repel an approaching fit, but bring up matter ſeemingly as clear as water, but (whether preſently, or after ſome time, I remember not) if ſtirred with a ſtick is ropy and viſcous like the whites of eggs. The moſt of evacuating phyſick, that he uſeth, is now and then ſome very gentle pills, ſcarce more than to keep the body ſoluble. But (beſide what others I know not) the chief remedy he applies (and with good ſucceſs) is an arcanum (which my other papers mention) much of kin to ſpirit of harts horn; but, he ſaith, more prevalent than either that or ſoot (for he uſeth them all very frequently with his patients;) and I ſuppoſe it is ſome animal ſpirit, but from ſome other animal (yet not ſpirit of blood neither,) of which ſhe hath taken abundance, I think conſtantly, about an hour or two before dinner, and before ſupper. To which he attributes what of preſervation or cure is wrought. Dr. *Willis* (upon the account above) hath delivered his judgment of it to be a diſaffection in *genere nervoſo*; and adviſeth ſpirit of harts-

horn, or of ſoot, which agrees well enough with the judgment and courſe already taken. He tells me of a peculiar juice he apprehends to be conveyed by the nerves, quite different from the circulation of the blood. While I was in the country with her (after the date of the paper, which gives account of it) ſhe had ever and anon rather attempts of fits than perfect fits, but ſevere enough, if ſhe had not known worſe, if at any time ſhe did eat either more freely, or more haſtily than ordinary (for ſhe is forced to be very moderate, and very deliberate in eating.) Any ſudden ſurpriſe of paſſion (whether joy, grief, or other) is very apt to diſcompoſe her. Theſe fits keep her very faint and feeble, though not ſick. If they return with the winter, as they were laſt winter, they muſt needs be very dangerous: if but as they are, they muſt weaken, and muſt needs threaten very ill conſequents.

Oxford, April 29, 1665.

SIR,

YOUR honour doth not expect I ſhould tell you, that I have already read over that excellent book of yours, which I received this day from your favour. But I have already peruſed ſo much thereof, and ſeen therein ſo much of worth, that I ſee great cauſe not only for myſelf to thank you, (which I heartily do) but for mankind to do the like; for ſo much of coſt and pains, which you have ſuſtained to enrich them. Which ſhould they fail to do, you would thence have occaſion to enrich your ſecond title, with one general more, of ſubjects diſpoſed to be frozen; while yet I ſhall deſire to have the honour of being ranked under your third title of ſubjects indiſpoſed; nor ſhall I think that indiſpoſition to be a diſeaſe, but a duty. Sir, I hope your honour hath received thoſe papers, which on Monday laſt I ſent, with a letter directed to your honour, by *Bartlet* the carrier. Which, becauſe of frequent neglects in carriers, I take this occaſion to mention; not that I think them of ſo much worth, as that I ſhould be ſolicitous about the miſcarriage of them; but, that I would not be thought guilty of diſobeying your commands, intimated in your honour's laſt to me; and becauſe I am ambitious of ſubmitting all I do to your honour's judgment, having had ſo oft experience both of your ability to judge, and of your inclination to be favourable to,

SIR,

your honour's very humble
and obliged ſervant,
JOHN WALLIS.

SIR, if you have the opportunity of ſeeing Sir *Robert Moray*, you may pleaſe to repreſent him my humble ſervice; and aſſure him, that as I am ambitious to obſerve all his commands, ſo I ſhall be particularly careful of thoſe concerning the gentleman he recommended to me in his laſt.

3

Oxford, July 17, 1669.

SIR,

AFTER my humble thanks for the honour of your's of July 3, I thought it not unfit to give you ſome account of our late proceedings here. Friday, July 9, was the dedication of our new theatre. In the morning, was held a convocation in it, for entering upon the poſſeſſion of it. Wherein was read, firſt, the archbiſhop's inſtrument of donation (ſealed with his archiepiſcopal ſeal) of the theatre, with all its furniture, to the end that St. *Mary*'s church may not be further profaned by holding the act in it. Next, a letter of his, declaring his intention to lay out two thouſand pounds for a purchaſe to endow it. Then, a letter of thanks to be ſent from the univerſity to him; wherein he is acknowledged to be both our creator and redeemer; for, having not only built a theatre for the act, but, which is more, delivered the bleſſed virgin from being ſo profaned for the future, he doth (as the words of the letter are) *non tantum condere, hoc eſt creare, ſed etiam redimere.* Theſe words (I confeſs) ſtopped my mouth from giving a place to that letter, when it was put to the vote. I have ſince deſired Mr. vice-chancellor to conſider, whether they were not liable to a juſt exception. He did, at firſt, excuſe it; but, upon further thoughts, I ſuppoſe he will think fit to alter them before the letter be ſent and regiſtered. After the voting of this letter, Dr. *South*, as univerſity orator, made a long oration. The firſt part of which conſiſted of ſatyrical invectives againſt *Cromwell*, fanaticks, the Royal Society, and new philoſophy; the next, of encomiaſticks, in praiſe of the archbiſhop, the theatre, the vice-chancellor, the architect, and the painter; the laſt, of execrations againſt fanaticks, conventicles, comprehenſion, and new philoſophy; damning them *ad inferos, ad gehennam.* The oration being ended, ſome honorary degrees were conferred, and the convocation diſſolved. The afternoon was ſpent in panegyrick orations, and reciting of poems in ſeveral ſorts of verſe, compoſed in praiſe of the archbiſhop, the theatre, *&c.* and crying down fanaticks. The whole action begun and ended with a noiſe of trumpets; and twice was interpoſed variety of muſick, vocal and inſtrumental; purpoſely compoſed for this occaſion. On Saturday and Monday, thoſe exerciſes appertaining to the act and veſpers, which were wont to be performed in St. *Mary*'s church, were had in the theatre. In which, beſide the number of proceeding doctors (nine in divinity, four in law, five in phyſick, and one in muſick) there was little extraordinary; but only that the *terræ filius*, for both days, were abominably ſcurrilous; and ſo ſuffered to proceed without the leaſt check or interruption, from vice-chancellor, pro-vice-chancellors, proctors, curators, or any of thoſe, who were to govern the exerciſes: which gave ſo general offence to all honeſt ſpectators, that I believe the univerſity hath thereby loſt more reputation, than they have

gained

gained by all the reſt; all or moſt of the heads of houſes, and eminent perſons in the univerſity, with their relations, being repreſented as a company of whore-maſters, whores, and dunces. And, among the reſt, the excellent lady, which your letter mentions, was, in the broadeſt language, repreſented as guilty of thoſe crimes, of which (if there were occaſion) you would not ſtick to be her compurgator; and (if it had been ſo) ſhe might (yet) have been called whore in much more civil language. During this ſolemnity, and for ſome days before and ſince, have been conſtantly acted, by the vice-chancellor's allowance, two ſtage plays in a day (beſides thoſe of the duke of *York*'s houſe) at a theatre erected for that purpoſe at the Town-hall; which (for ought I hear) was much the more innocent theatre of the two. It hath been here a common fame for divers weeks (before, at, and ſince the act) that the vice-chancellor had given three hundred pounds bond (ſome ſay, five hundred pounds bond) to the *terræ filius*, to ſave them harmleſs, whatever they ſhould ſay, provided it were neither blaſphemy, nor treaſon. But this I take to be a ſlander. A leſs encouragement would ſerve the turn with ſuch perſons. Since the act (to ſatisfy the common clamour) the vice-chancellor hath impriſoned both of them: it is ſaid, he means to expel them. But enough of this.

I AM next to acquaint you with a diſcourſe of another nature; and which, I truſt, will be, if not more acceptable, yet leſs ungrateful than the former. Since the act, Sir *James Langham* (with his lady, and ſome other perſons of quality) did me the honour to dine with me. He is a perſon, of whom I have ſometime heard you ſpeak with very good reſpect; and whom (I think) I may ſafely repreſent as one, who honours you very much, and who hath divers times told me, how ambitious he ſhould be of obtaining a nearer acquaintance with you. He was telling me of an excellent lady, of whom he hath a very great eſteem: and I have the leſs reaſon to think him miſtaken in his judgment, becauſe he hath had all the opportunities of knowing her very well; having married a ſiſter of hers, and, upon that occaſion, being thoroughly acquainted with the ſtate of that family. It is the lady *Mary Haſtings*, a daughter of the counteſs of *Huntington*, and ſiſter to the preſent earl, and to the lady *Elizabeth*, in whom Sir *James* did think himſelf very happy, while he enjoyed her as his wife. Of this lady he gives ſo high a commendation for her temper, her parts, her worth, her virtues, her piety, and every thing elſe; as makes him extremely ſolicitous to ſee her happy in a ſuitable conſort; and doth profeſs himſelf ſo ſerious in it, that, were it a thing lawful, there is no lady he knows, whom he ſhould ſooner have made choice of, to have ſucceeded her ſiſter in that capacity. It is true, I have not my ſelf been ſo happy, as to know that excellent lady; but he, that hath had the opportunity of knowing her ſo well, doth repreſent her, not only ſo accompliſhed, as to make an excellent wife, but particularly as an excellent wife for eſquire *Boyle*; and doth undertake to anſwer all objections, not only which you might make as to the lady, but (which perhaps may be the greater difficulty) as to the condition alſo; and hopes he ſhall be able to ſhew you reaſons, not only, to marry her, but to marry. I ſhould have added (though that be a conſideration of leſs moment, than ſome of the reſt) that her portion will be at leaſt four thouſand pounds, and ſo much he will ſee made good; her age, about five or ſix and twenty: and as to her perſon, virtues, and other perfections, you will have ſo many ways of informing yourſelf, that what I might ſay would be ſuperfluous. If I might be a happy inſtrument in making two ſo excellent perſons happy in each other, as he perſuades me I might, if you think fit, I do not know, in what elſe I could more approve myſelf,

SIR,

Your honour's very humble

and affectionate ſervant,

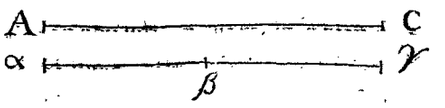
JOHN WALLIS.

You will oblige me, to preſent my ſervice to the very good lady, with whom you are; and to preſerve me a place in her good opinion. And you will doubly oblige my wife, at this time, to afford her the like in your's.

Oxford, March 14, 1676-7.

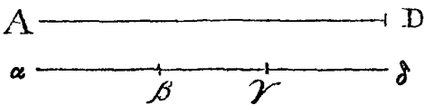
SIR,

I HAVE thought fit to give you notice of a diſcovery, that hath been made here (about three years ſince, or more) which I ſuppoſe may not be unacceptable to thoſe of the Royal Society, who are muſical and mathematical. It is this, whereas it hath been long ſince obſerved, that if a viol ſtring, or lute ſtring, be touched with the bow or hand; another ſtring on the ſame, or another inſtrument, not far from it (if an uniſon to it, or an octave, or the like) will at the ſame time tremble of its own accord. The cauſe of it (having been formerly diſcuſſed by divers) I do not now enquire into. But add this to the former obſervation, that not the whole of that other ſtring doth thus tremble, but the ſeveral parts ſeverally, according as they are uniſons to the whole, or the parts of that ſtring, which is ſo ſtruck. For inſtance;

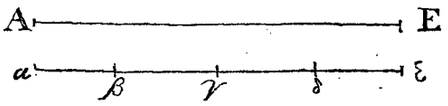


ſuppoſing *A C* to be an upper octave to *α γ*; and therefore an uniſon to each half of it, ſtopped at *β*. Now if, while *α β* is open, *A C* be ſtruck, the two halves of this other,

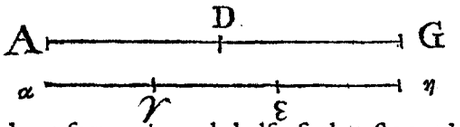
other, that is $\alpha\beta$ and $\beta\gamma$, will both tremble, but not the middle point at β; which will eaſily be obſerved, if a little bit of paper be lightly wrapped about the ſtring $\alpha\gamma$, and removed ſucceſſively from one end of the ſtring to the other. In like manner, if AD



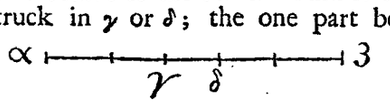
be an upper twelfth to $\alpha\delta$, and conſequently an uniſone to its three parts equally divided in $\beta\gamma$. Now if $\alpha\delta$ being open, AD be ſtruck, its three parts $\alpha\beta$, $\beta\gamma$, $\gamma\delta$, will ſeverally tremble; but not the points $\beta\gamma$, which may be obſerved in like manner as the former. In like manner, if AE be a double



octave to $\alpha\varepsilon$; the four quarters of this will tremble when that is ſtruck; but not the points $\beta\gamma\delta$. So, if AG be a fifth to $\alpha\eta$;



and conſequently each half of that ſtopped in D, an uniſon to each third part of this ſtopped in $\gamma\varepsilon$: while that is ſtruck, each part of this will tremble ſeverally, but not the points $\gamma\varepsilon$: and while this is ſtruck, each part of that will tremble, but not the point D. The like will hold in leſſer concords; but leſs remarkably, as the number of diviſions increaſe. This was firſt of all (that I know of) diſcovered by *William Noble*, a maſter of arts, of *Merton* college; and by him ſhewed to ſome of our muſicians about three years ſince; and after him, by Mr. *Thomas Pigot*, a batchelor of arts, and fellow of *Wadham* college, who giving notice of it to ſome others, found, that (unknown to him) the ſame had been formerly taken notice of by Mr. *Noble*, and (upon notice from him) by others, and it is now commonly known to our muſicians here. Of this you will find a particular notice is taken in Dr. *Plott*'s natural hiſtory of *Oxfordſhire*, now in the preſs, and will be ſoon abroad. I add this further (which I took notice of, upon occaſion of making trial of the other) that the ſame ſtring, as $\alpha\gamma$, being ſtruck in the midſt at β (each part being uniſon to the other) will give no clear ſound at all, but very confuſed. And not only ſo (which others alſo have obſerved, that a ſtring doth not ſound clear, if ſtruck in the midſt) but alſo if $\alpha\delta$ be ſtruck at β or γ, where one part is an octave to the other. And in like manner, if $\alpha\varepsilon$ be ſtruck at β or δ, the one part being a double octave to the other. And ſo if $\alpha 3$ be ſtruck in γ or δ; the one part being a



fifth to the other. And ſo in other like conſonant diviſions. But ſtill the leſs remarkable, as the number of diviſions encreaſeth. This, and the former, I judge to depend upon one and the ſame cauſe, *viz.* the contemporary vibrations of the ſeveral uniſon parts; which make the one tremble at the motion of the other: but when ſtruck at the reſpective points of diviſion, the ſound is incongruous, by reaſon that the point is diſturbed, which ſhould be at reſt. I add no more, but that I am,

Yours, *&c.*

JOHN WALLIS.

Mr. Edward Stillingfleet *to Mr.* Robert Boyle.

Sutton, October 6, 1662.

SIR,

I HOPE my diſtance from home (ſince the time you were pleaſed to honour me with that great teſtimony of your reſpect in that excellent diſcourſe you ſent me) will plead ſomething by way of apology for my incivility, in being ſo backward in expreſſing my high reſentments of ſo great an honour. Sir, as there is no perſon in our nation hath more obliged the world than yourſelf have done, in the diſcourſes you have lately made the world acquainted with, ſo it is the earneſt deſire of all ſuch, who value reaſon and knowledge, that you will pleaſe ſtill to employ your excellent pen in a further diſcovery of thoſe rich mines of experimental philoſophy, which with ſo great happineſs and ſucceſs you have been converſant in. And although the privacy and retiredneſs of my abode hath made me ſomewhat uncapable of thoſe high improvements, which others have the advantage of; yet it is here my happineſs and delight, to converſe with thoſe excellent perſons, who have endeavoured to make the world the wiſer for their being in it. Among whom your great name is deſervedly placed, not only for your deep ſearch into nature, but your ſucceſsful pains in vindicating the honour of religion. Sir, I could heartily wiſh you would pleaſe to communicate to the world thoſe papers you are ſomewhere pleaſed to mention, in behalf of Chriſtianity (againſt *Hobbes*, p. 11.) that it may be ſeen yet further, that thoſe great perſonages, who have courted nature ſo highly, that her cabinets are open to them, are far from looking on religion as mean and contemptible. But I ſhould be injurious to yourſelf, and the world, to exerciſe your patience with a tedious letter. The only favour I deſire is, that you will pleaſe to account among the train of thoſe, who moſt honour your perſon and undertakings,

SIR,

your moſt obliged ſervant,

EDW. STILLINGFLEET.

Letters from Dr. Lower *to Mr.* Boyle.

Chriſt-Church, Oxford, Jan. 18, 1661.

Honoured Sir,

I RECEIVED your letter, and ſhould have wrote to you ſooner, but that the doctor was not at leiſure till of late to make thoſe diſſections of the brain, which he hoped; but at length we have had the opportunity of cutting up ſeveral, and the doctor, finding moſt parts of the brain imperfectly deſcribed, intends to make a whole new draught thereof, with the ſeveral uſes of the diſtinct parts, according to his own fancy, ſeeing few authors ſpeak any thing conſiderable of it; ſo that at preſent I ſhall ſuſpend my thoughts which I had of ſending you a relation of the diſcourſe we had in the ſeveral diſſections, and only tell you, that, according to his opinion of the uſe of the cerebellum for involuntary motion, he ſhewed me ſeveral times the nerves (which authors call the ſixth conjugation) to proceed out of a ſtalk or ſtem, which comes down out of the cerebellum, and makes a great half circle under the medulla oblongata, and ſo returns and ends in that nerve, on each ſide; which half circle is clearly diſtinct from the medulla oblongata, by comparing the ſeveral texture and poſition of their fibres, as well as their outward line and figure; ſo that one may very well conceive, that circle to ſerve for a diſtinct and particular uſe, and to differ from the medulla oblongata, as well as to conceive the ſpinal marrow, with the medulla oblongata, to be really diſtinct organs (which is certain from palſies of half the body) and yet they are not throughly divided, but only ſuperficially along the middle. The auditory nerves alſo, which lye next behind the other, and go into the os petroſum on each ſide of the ſcull, ſeem to ariſe out of another ring, though leſs than the former; into which ring deſcends alſo that ſtem out of the cerebellum. And *Varolius* formerly affirmed, that the auditory nerves came out of the cerebellum. The doctor likewiſe obſerved the cerebellum to be diſtinguiſhed into two medullary parts, the middle part (which being cut, does ſo elegantly reſemble a tree with branches) being as it were the pars corticalis dividing between the two medullary parts, for what uſe you may hereafter hear. He ſhewed likewiſe the optick nerves plainly to aſcend on each ſide of the bottom of the brain into thoſe two parts on each ſide the rima, about the middle of the medullary ſubſtance of the brain, where he thinks imagination to be performed, whence he judges to be that quick and moſt perfect communication between the ſight and the fancy, there being no ſenſe ſo certain and quick as that. In the cutting up the eye of a little dog, we held up the eye (after we had cut off all the muſcles, and fat, and ſkins, from the outward coat of the eye) to the ſun, and a candle, directing the cone of the light to the very optick nerve, and though it have no cavity as ſome affirm, yet it appeared very light, even as the flame of a fire, a pretty way up the nerve. Whether it may be ſeen in the eyes of greater animals, we have not yet tried, but ſuppoſe it will: and I believe the eye of a creature newly dead will be beſt to make trial, leſt the humours ſhould turn thick, as they do in a day's time. We took likewiſe the vitreal humour out, and dropped it into a glaſs of fair water, and could not find it again, or ſee it in the water; ſo that Dr. *Wallis* would not believe, that the vitreal humour was in the glaſs, till the water being poured away, it appeared in the bottom. We have likewiſe diſſected the ear, and I have prepared a bone full of the bones and parts of the ear for him, when he ſhall be at leiſure to conſider of it. But in all the diſſections we made, we could not diſcern or find that paſſage from the ear to the mouth, which anatomiſts mention to be ſo large, that juglers commonly take tobacco, and force the ſmoke out that way. And there is one Mr. *Henſhaw*, a fellow of *All-Souls*, who, by ſtopping his mouth and his noſtrils, can blow out a candle at either ear, or both at once; which ſeveral of the fellows have ſeen him do very often. He is much deaf, and cannot hear, unleſs the voice be loud, which perhaps may be from that large paſſage or cavity into his mouth, ſo that the tympanum is not affected ſo ſmartly with the ſound, as in others, who cannot ſhew the ſame trick. Some of the dogs, which we diſſected, we killed after the butchers way, by cutting in two the ſpinal marrow in the neck, juſt under the occiput, to ſee if the parts below the wound would retain any motion for a little while, becauſe ſome affirm, that ſince the ſpinal marrow is nouriſhed with arteries, as the brain is, that ſpirits are generated in it, for the motion of all the parts along as it goes; but the dogs never ſtirred any part below the wound, (for we did not tie them down to the table on purpoſe to try, but had a ſtrong fellow to hold them down, till execution was done) but the eyes moved and the eye-lids; but whether the heart did beat, becauſe its motion depends upon the nerve of the ſixth conjugation inſide the ſkull, we did not think of trying. I enquired of the doctor, what he thought of the nouriſhment of the liquor, which is thought to be in the nerves; and he told me, he did not think it did much nouriſh, if at all; yet, that there is a liquor in the nerves, he does believe, becauſe he hath often obſerved in thoſe men and women, that uſually are troubled with convulſions, epilepſies, or hyſterical fits, three or four days together, without any long intermiſſion, all that while their urine is little and very red, but afterward, when they recover from thoſe fits, they make water for the like ſpace of three or four days in very large quantity, and very clear, though they drink as little or leſs than formerly, when their fits were on them: the former urine he thinks to come from the blood, the latter he takes to be the water of the nerves; for when this water is made, there is a perfect ſolution of the diſeaſe, and

their heads become clear and light, which were before heavy, dull and turbulent.

THE doctor does likewiſe intend, when he ſhall have opportunity, to ſyringe in ſome kind of liquors, tinctured with ſaffron, or other colours, into the arteriæ carotides, the brain being firſt opened, juſt after the creature is dead, and warm, to try how the blood moves, and how the tincture may be ſeparated in the brain; in the mean time tying ſome of the nerves, to ſee, if they will ſwell above the ligature. Upon your relation of your experiment of *Tunbridge* water being ſyringed into a dog, a little while ſince I ſyringed into a dog's jugular vein about two quarts of warm water, and, in a little ſpace, his bladder was very much diſtended with urine, though a little while before he had diſcharged himſelf that way very freely, as uſually they do in ſuch ſolemn frights. I had not the opportunity of doing it again, but intend to try it with ſeveral liquors; and I have a fancy to try, how long a dog may live without meat, by ſyringing into a vein a due quantity of good broth, made pretty ſharp with nitre, as uſually the chyle taſtes taken out of your common receptaculum; for though it be not ſo finely prepared as chyle is, yet I have a belief, that it may ſerve turn a pretty while; and ſince I read the ſtory in *Sneider de Catarrhis*, in quarto, of a man being drunk and bruiſed with a fall, when he was let blood, at the firſt tapping of the vein, they that were preſent immediately ſmelled the wine more ſtrongly, than if it had been ſtewed over a fire; I do think, that many liquors may conſiſt with the blood as well as that; broth being nearer to chyle than ſack, and conſequently more fit to nouriſh: and doubtleſs a bitch's milk ſyringed in the ſame manner would preſerve the life pretty well, if it be done in juſt time and proportions, were it not, that the milk loſes much of that tartneſs and nitroſity, by circulating in the blood before it is ſeparated again in the breaſts, which it had in the veſſels before it went into the blood; and if it were not for this change, the chyle and milk would be ſtill the ſame; and therefore, being ſyringed in often in ſmall quantities might perhaps preſerve the life, as the continual inſtilling of it in, out of the vaſa thoracica, into the axillary vein, doth: and, in children, or other perſons, who ſuffer a fluxus chyloſus, or diarrhæa, becauſe the glandules of their meſenteries being ſcrophulous or ſchirrous, by compreſſing the venæ lacteæ, hinder the farther paſſage of the chyle, and ſo, conſequently, ſtarve the patient, a woman's milk ſyringed in may ſomewhat ſupply the want of their chyle, provided the nurſe eat ſuch meats as the patient formerly did, ſo that the milk may not be too weak or ſtrong for his blood: and this in men might be done better than in beaſts, becauſe they can tell, when they are faint, hungry, or thirſty, and ſo may be ſatisfied accordingly. When I am in the country, if I can have leiſure to attend it, I ſhall try it in a dog, and I ſhall get a tin pipe made, about two inches long, and about the uſual bigneſs of the jugular vein, and hollow, which I may put into the vein, by cutting the vein aſunder, and drawing on the two ends of it upon the pipe, and tie it round with a thread there to remain, and, in the middle of the pipe, muſt come out a ſmaller pipe, fit for the ſmall end of a ſyringe to go into, which may be ſtopped with a cork, to take out when need ſhall require: the figure of it is thus. There be many inconveniencies would diſſuade the trial hereof, as namely, that for want of chyle and liquor in the guts, to dilute and mitigate the choler all along in its paſſage from the duodenum, the guts may be ulcerated and inflamed, with many more; but howſoever I ſhall try, either what good or harm will follow. In the mean time, I have nothing more to tell you, but, that when I return, I ſhall bring with me (God willing) thoſe odd kind of ſtones and minerals, which the miners cannot give an account of; as there be ſome, which are as heavy as lead, and of ſeveral colours, which they cannot tell what they are. But, Sir, I am ſenſible of the great trouble I give you by this long letter, and beg your pardon; which I hope I may the more eaſily obtain, by the aſſurance I give you by my long journey, that I ſhall not offend in the like for a good while. I therefore take my leave, and remain,

your moſt obliged, and

very humble ſervant,

R. LOWER.

Chriſt-Church, Oxon, Nov. 26, 1662.

Moſt Honoured Sir,

I SHOULD have ſent you this incloſed ſooner, but that I have been out of town, ſo that I had not the opportunity of tranſcribing it till now. The doctor hath now perfected the anatomical part likewiſe, but being not ſatisfied in ſome things, I ſuppoſe he will hardly be induced to publiſh them yet a good while. Since my return hither, I have received ſome Corniſh diamonds, which I have ſent you, together with this letter. Thoſe, which I gave Mr. *Stall*, were very dull and thick, and but little more tranſparent than alum; ſo that I did not think them worth ſending to you, though I purpoſely procured them for you. I have ſent into *Cornwall* for thoſe mineral pieces, which I mentioned to you, and as ſoon as I receive them, I ſhall acquaint you with it. And when you certify me, what authors you have already collected, you may direct me what other you would have me firſt collect, and I ſhall employ all the leiſure I have to anſwer your expectation therein: and if you pleaſe in your next to communicate unto me thoſe preparations of laudanum, ſpirit of hartſhorn, and that ſpe-

cifick for the rickets, I ſhall faithfully obſerve thoſe conditions, on which you part with them, and remain,

SIR,

your ever moſt obliged,

and moſt humble ſervant,

RICH. LOWER.

April 27, 1663.

Moſt Honoured Sir,

HAVING received your letter, I went to the regiſter of the univerſity, who keeps the records of all things acted in the convocation, and regiſters the names of all perſons, who take any degrees; and, by the information I gave him of the time, he preſently found the gentleman in the regiſter of that year, recorded to have been admitted batchelor of phyſick, the very firſt convocation after the earl of *Pembroke*'s coming to viſit the univerſity; but he could not find any thing of his taking a maſter's degree that year, or any other; for he ſearched ſeveral years before and after: ſo that I have ſent what I found (and which, I ſuppoſe, will be ſufficient for the gentleman's purpoſe) atteſted by the regiſter, or publick notary, whoſe name is authentick in any certificate; for he being a ſworn officer, his teſtimonial cannot be refuſed: and there is none, that takes any degree, who has any more than his ſingle certificate, or elſe I ſhould have ſent it confirmed with more hands, but that it had not been the uſual way. As for Mr. *Hewes*'s powder, I inquired of Dr. *Willis* concerning it (having ſeen two ſad examples of it myſelf) and he told me, that though he had ſeen it uſed ſometimes ſucceſsfully enough, yet ſince he hath known ſo much harm done by it, that he would never adviſe any one to venture to take it any more, eſpecially if the perſon be of a lean habit of body; but if the perſon be fat and full, there is not ſo much hazard or inconvenience to be feared. Madam *Walton* made a ſad experiment of it the laſt year; for with one doſe of his powder (which ſhe was perſuaded to take by Dr. *Lamphyre* for the ſcurvy, and fits of the ſpleen) ſhe fell into a great flux, and ſalivated a full half year, without any intermiſſion, which could not be ſtopped with all the drying diet-drinks, purges, bleeding, baths, or any thing, which the doctors at *London* could invent. At length ſhe came down hither, and being reduced to a mere ſkeleton, and not being able to ſleep above an hour or two in a week's time, Dr. *Willis* perſuaded her to drink milk, and nothing elſe, which ſhe did with much refreſhment; but the cold weather coming ſuddenly on, put her again into her former flux, which in three weeks time after ended her miſery: and when ſhe died, I never ſaw a more exact ſkeleton, except that it was clothed with ſkin. Sir, if it may not be a trouble, Dr. *Willis* and myſelf ſhall be very much obliged to you for thoſe paſſages of *Regius*, concerning Dr. *Bills*'s experiment, which he nor I ever ſaw yet, unleſs it be in his *Hepar Redivivum*, which *Bartholine* wrote againſt, and which *N. Stenon* makes mention of in his tract *De Glandulis*. If the meaning of the paſſages be eaſy to comprehend, without the ſcheme, the Dr. would by no means give you the trouble of ſending it. Sir, I am very ſorry, that I can give you no account, as yet, of what I promiſed you; for I have been wholly diverted by Dr. *Willis*, whoſe deſire it is, that I ſhould be preſent at his operations, which now are very near finiſhed, and I hope will make ſome apology to you for my idleneſs before long; for the Dr. intends, before Midſummer, to put his book into the preſs; which is all, that I can tell you at preſent, but that I am,

SIR,

your moſt obedient,

and humble ſervant,

R. LOWER.

I RETURN you many thanks for the laudanum, which you ſent, and for thoſe other preparations, which you were pleaſed to communicate to me. I have not had much opportunity of trying them as yet, but as ſoon as I can, I ſhall give you an account of the ſucceſs.

DR. *Willis* preſents you his ſervice. Dr. *Bathurſt* is in *London*.

You will take notice of *perſcrutatis* taken paſſively, which I deſired the regiſter to alter for *examinatis*; but he told me, it was the word uſed in the ancient certificates, and therefore was more authentick, than a better word, and truer Latin.

June 4, 1663.

Moſt honoured Sir,

I RECEIVED your papers incloſed in Mr. *Hook*'s letter long ſince, but have not had an opportunity of returning you my thanks till now; and I hoped, that Dr. *Willis* would have excuſed it, when he went to *London*, but it ſeems he had not the happineſs of finding you at your lodgings. We have read thoſe papers, and find but little conſiderable in them, except only what he mentions about the ventricles of the brain, and that he deſcribes very obſcurely; yet it being ſomewhat agreeable to the doctor's deſcription, hath made him reſolve to print his anatomy forthwith. Dr. *Wren* hath drawn moſt excellent ſchemes of the brain, and the ſeveral parts of it, according to the doctor's deſign, and the next week he will have finiſhed the ſcheme of the eighth pair of nerves, and then all the work is at an end. I ſhall not trouble you with the manner or deſcription of any part of it, but only acquaint you with one or two obſervations we lately made: one was in a gentleman's head, (whoſe body we opened

for

for another diſeaſe more fatal to him) in which the carotidal artery in the right ſide (inſide the ſcull) was wholly choked up and obſtructed with a yellow ſubſtance, perfectly hardened into a ſtone, whereby the courſe of blood being totally hindered on that ſide of the brain, did probably come in more vehemently into the other artery on the left ſide of his head, which tormented him very much a quarter of a year before his death, and made him much more impatient of his other diſeaſe. And this reaſon of his hemicrania ſeems more probable by what we have ſeveral times obſerved in others; for in ſome, whom we have opened, we have found both the carotidal arteries all along from the very heart into the brain almoſt filled with a rope, as it were, of congealed blood, turned yellow by long ſtagnation (which is very commonly found in bodies, which lye languiſhing under chronical diſeaſes) ſo that but very little ſpace was left for any blood to paſs through thoſe veſſels; yet both being equally obſtructed, the perſons never complained of any ſuch ſymptom as the man before mentioned. Since that we have made another experiment, which is this. Whereas ſeveral anatomiſts, and particularly *Webfer* in his book *De Apoplexiâ*, finding in ſeveral bodies dead of apoplectical fits the carotidal artery full of ſuch a congealed ſubſtance, as I mentioned before, have made it the chief cauſe of apoplexies; becauſe, as he ſuppoſes, the influx of blood into the brain being by that means totally intercepted, conſequently the ſpirits for want of ſupply muſt extinguiſh, and ſo all ſenſe and motion periſh. All which need not at all to be feared, granting, that both the carotidal arteries were choked up, ſo that not the leaſt drop of blood could paſs through either of them: for the carotidal and vertebral arteries have ſo many anaſtomoſes, ſo divinely contrived inſide the dura mater, before they go up into the brain (as you will ſee exactly deſcribed in the doctor's ſcheme) that if three arteries were quite obſtructed, the fourth would convey blood into all parts of the brain and cerebellum, ſufficient enough for life and motion. And to confirm this, this week we took a young ſpaniel, and tied both the carotidal arteries in the neck very faſt and cloſe with ſilk, and the dog was not at all altered by it, but continued very lively and briſk, and was ſo far from taking unkindly what was done to him, that within a quarter of an hour after, he got loſe and followed the doctor into the town, as he viſited his patients. In this pleaſant humour he continued two or three days, and then we opened his head, and found all the veſſels of the brain as full of blood as uſually they are in other dogs, who did not ſuffer the ſame experiment. But this I might have told you in a ſhorter time; for if one artery be ſyringed with any tincted liquor, all the parts of the brain will equally be filled with it at the ſame time, as ſeveral times we have tried The other experiment is this. Whereas all authors, and particularly Mr. *Delbaoe* in his Theſes, ſay, that the water falls from the ventricles of the brain by the infundibulum upon the throat and palate, *&c.* we experimented it quite otherwiſe lately in a calf's head, after this manner: under the glandula pituitana in a calf's ſcull, there are commonly one or two holes, which receive veſſels from the glandule, into which hole we ſyringed in milk, and immediately it came out of the jugular veins more ſlowly or faſt, according as the milk was injected; but looking into the mouth, we could not diſcover the leaſt drop of milk; whereupon we tried the ſame with ink, and it came all out of the jugular veins, but not a drop appeared any where about the mouth or throat, nor the leaſt tincture of ink: and to be more ſure, we continued ſyringing and opening the jugular veins, until we followed it to the ſide of the bone, whereon the glandula pituitana lies, and there we found a pretty great veſſel come out of the hole in that bone (in the outſide of the bone) into the very cavity of the jugular vein: and it being thus in that animal, the doctors next work is to ſearch and inquire how it is in men, there being great hopes in the mean time, that they both agree, that ſo the old doctrine of catarrhs may be waſhed away. There are very many like experiments in the doctor's book, but I ſhall not give you any farther trouble at this time, but only return you very many thanks for the glaſs of laudanum you ſent me, which I have uſed with very great ſucceſs and credit in the cholick, gout, *&c.* and more particularly in thoſe grievous torments of the belly and ſtomach proceeding from the ſcurvy, to all which it hath given preſent eaſe, by cauſing great and ſudden ſweating. I never obſerved the utmoſt doſe of it to give ſleep, but only a pleaſing drowſineſs and inclination to reſt, which uſually ceaſed with their ſweating. As ſoon as this glaſs is ſpent, I ſhall earneſtly deſire another from you, and I will tender you a particular account of both together. In the mean time I beg your pardon for giving you this diverſion, and haſte to remain

Your moſt obliged, and

moſt humble ſervant,

RICH. LOWER.

June 24, 1664.

Moſt honoured Sir,

SINCE you were pleaſed ſo favourably to receive my laſt long letter, I have ventured once more to ſend you another concerning ſome farther obſervations in the way of our employment.

THERE happened the laſt winter a great rot (as they call it) or diſeaſe in ſheep, ſo that they being very cheap, I had frequent opportunity of inquiring into them, and into the cauſe of their general diſeaſe: moſt of them I have obſerved to have dropſies in their bellies, others in their breaſt alſo. I took out of ſeveral of their bellies four or five quarts

(more or leſs) of reddiſh water, even juſt ſuch as there is in men, that die of dropſies; and after the water was taken out, all the veſſels appeared very clear and plain, eſpecially the lymphatick veſſels, which were every where more large and turgid with clear water, than ever I ſaw in any large greyhound or maſtiff; ſo that *Bartholinus*'s conjecture cannot be true, that dropſies come from the breaking of the lymphatick veſſels within the cavity of the abdomen, (but rather it ſeems to come immediately out of the ends of the arteries, and that becauſe it is always of a thin bloody colour.) Theſe lymphatick veſſels I found in the ſame manner large and turgid in ſix or ſeven ſeveral ſheep, who had the like quantities of water in their bellies, when I killed them.

BUT the great and conſtant diſeaſe I always diſcovered was in their livers, and that but only in one part of the liver, *viz.* in the veſſels of the porus biliarius, all whoſe veſſels and branches were always more or leſs full of broad live worms like little plaices, with a kind of dark rotten ſanies, in which they lay: in ſome livers they were ſo numerous, that they ſwelled the branches of the porus biliarius, and made it ſtretch into ſeveral abſceſſes or cells in which they lodged; beſides the veſſels of the porus biliarius, the bladder of gall was moſt commonly full of the ſame; and the ductus communis all along into the very entrance into the duodenum, and many times I found them travelled as far as the ſmall guts. In theſe places and veſſels I conſtantly found them in all ſheep, and no where elſe, for the veſſels of the vena porta, and the vena cava in the liver, had not the leaſt appearance of any worm, or any ſanious or diſcoloured matter in them. In the next place I tried how to kill them, which I tried by pouring ſeveral liquors on them, as ſpirit of urine, aqua vitæ, ſpirit of ſal armoniac, *&c.* all which did make them ſtir a little more than ordinary, but without much more inconvenience. Then I tried ſpirit of ſalt, and the leaſt drop of that did not only kill them ſtark dead without any further motion, but ſhrinked them up preſently, and quite changed their colour from dark to white; and did likewiſe præcipitate that dark kind of ſanies, in which they lay, into a white ſlime, ſo that the worms looked as if they had been pickled a month. This I repeated in ſeveral ſheep with the ſame event, which called to mind the remedy, that I have often ſeen uſed in our country with very ſtrange ſucceſs, which was at ſpring and fall of the year, when the dew is counted moſt dangerous, to drench thoſe ſheep, which they perceived to grow faint and ſickly, with ſix or ſeven ſpoonfuls in a morning faſting, (they being kept from meat all night on purpoſe) of very ſtrong brine, and ſtale urine with ſoot ſteeped in it; and this courſe of phyſick they continued eight or ten days, or till they perceived them to eat their meat heartily, and to keep company again with their fellows; and if they were taken in time, there ſeldom died any ſheep in a whole flock. The other remedy uſed by people, that lived neareſt the ſea, was to turn their ſheep to feed in the ſea-marſhes after the tide was gone out, and there to continue them between every tide for a fortnight, and then to take them home, where they remained not only healthy, but moſt commonly grew very fat; yet I enquired of our butchers, who converſe with the people in this country, and they never heard any ſuch thing uſed in this country.

THOSE ſheep, whoſe lungs were full of bladders of water, I could never find any worms in thoſe bladders, nor any where elſe, but in thoſe veſſels of the liver.

IN all theſe ſheep I found the vaſa lactea in the meſentery filled with water, ſo that they looked like lymphatick veſſels; and I ſuppoſe, that it is only in carnivorous creatures, that the chyle is white, and thence we may give that denomination to thoſe veſſels in ſuch like creatures, which colour I ſuppoſe is not found in thoſe animals, that feed only on graſs and water.

OR what I ſuſpect alſo, that the venæ lacteæ may have ſome little veſſels diſſeminated in the guts (beſides thoſe, that terminate in the guts to receive the chyle) to ſerve and ſupply the office of lymphæducts, which is as neceſſary to be done in the guts as any where elſe in the body, for there are as many veſſels of blood there, as any where elſe in the body; and there may be as great reaſon, that the chyle be diluted with that thin liquor in thoſe little veſſels, as well as in the commune receptaculum, thoſe ſmaller veſſels being more likely to be obſtructed than the vaſa thoracica; and yet I do not think the only uſe of the lympha in its general conflux from all parts of the body to the common receptacle, is only to dilute the chyle for its eaſier paſſage, but chiefly to prepare it for a better mixture with the parts of the blood; for, as *Stenon* obſerves, it is ſuch a kind of liquor, that it will readily incorporate with any other liquor or body, that we take. Since in a dog, which I fed, but was forced to hang an hour or two ſooner than I was reſolved, I found the venæ lacteæ of the upper half of the meſentery full of chyle, and the other venæ lacteæ of the lower half to contain a clear water, which I ſuppoſe was the thinner and potulent part of his entertainment, which had been expreſſed out of the ſtomach firſt.

IN the ſame dog I found two very large lymphatick veſſels coming from one of the kidnies, and ending in the commune receptaculum. I confeſs I was in hope, at firſt ſight of them, that they had been veſſels, which come from the commune receptaculum, and ended in the cavity of the pelvis of the kidney, that thereby an account might be given of the ſudden and large quantity of water, made after drinking mornings draughts; but I was deceived.

BESIDES in that and in ſeveral other dogs, I have ſeen, and can ſhew at any time, ſeveral venæ lacteæ coming out of the duodenum juſt below the pilorus, and climbing over the

pancreas, and thence tending to and terminating in the commune receptaculum, but not one coming out of the pancreas, or ending in it.

IN the ſame dog I took a ſpoonful of chyle out of the common receptacle, and poured into it ſome of the gall of the dog; and they preſently mixed together as ſoon and as well as water would with urine; ſo that I believe they are as much miſtaken, who affirm, that the gall will not mix with the chyle in the guts, as they are, who ſay the gall doth not come into the guts, till the chyle be all gone by.

IN another dog ſince I tried an experiment for Dr. *Willis*, to ſee whether any chyle doth go into the meſeraick veins, as well as the venæ lacteæ (out of which the doctor will not be perſuaded.) We fed the dog, and after five hours found all the venæ lacteæ full; whereupon we filled the duodenum and the jejunum with ink, diluted with ſpirit of wine, and ſqueezed the gut between the two ligatures, to ſee if any of the tincture would go into the venæ meſaraicæ, but could not obſerve any; and, which was more obſervable, none of it went into the venæ lacteæ, not ſo much as to give the leaſt colour. So that their mouths ſeem not to be directly open into the guts, for otherwiſe the more the gut was ſtretched, the wider they would have been; whereas if they come between the coats, as the ureters into the bladder, or the ductus communis into the duodenum, the more the guts were diſtended, the more compreſt their entrance would be.

So that this experiment failing, we are trying to feed a dog with ſome tinctured liquor, which probably may retain its tincture in the chyle (there being ſeveral things, which retain their tincture to the very bladder) notwithſtanding all thoſe ſeveral changes and paſſages they do firſt undergo, as the decoction of madder-roots in milk, or broth, or ſome ſuch thing, will render the very urine red, as rhubarb doth ſtain it yellow, when it is given in purging infuſions.

ONE thing more I have ſeveral times ſeen in great large dogs, *viz.* the eighth pair of nerves accompanied all along the neck with two veſſels of blood in the coat of it, one on one ſide of the nerve, the other on the other ſide. I ſuppoſe one was a vein, and the other an artery, but I wanted a microſcope to perceive the difference; and I verily think, that every nerve, eſpecially the great ones, are nouriſhed with blood, as well as the brain and ſpinal marrow.

BEING occaſionally the other day at the butcher's, he ſhewed me a fat lamb, which he had killed, one of whoſe kidnies was as big as a boy's head of two or three years old, and very tranſparent, it being nothing but a congeries of ſeveral thin bladders containing a very clear water. I carried it to Dr. *Willis*, and we took a quart and a half of clear water out of it, beſides what was ſpilt. It had an emulgent vein and artery, but very ſmall and ſhrunk, but no ureter; the taſte of the water was ſalt, and the ſmell ſomewhat urinous: the other kidney was ſound enough.

So much for beaſts; in men, that have died and been opened here in town, I have obſerved theſe following caſes. In a ſenior fellow of a college, who died of a dropſy, we found not above three or four quarts of water in his belly, becauſe it had found vent by ſome ulcers in his legs, to the quantity of a pint every day, for three weeks together; ſo that he found ſo much eaſe and help for the preſent, that he beſpoke a new ſuit of clothes againſt the time he ſhould come abroad, but within a week after he decayed ſuddenly and died. His guts we found all grown together, and compacted like a bunch of grapes, which, I ſuppoſe, happened in the time of his ſickneſs. In his gall we found nothing liquid, but there were ſeven or eight black pills as exactly formed, as if they had been made in an apothecary's ſhop: we bruiſed one of them, and found by the colour, that the choler had been hardened into that form. I would have kept three or four of them to have tried, whether they would have had the operation of common pills; but the gentlemen's curioſity to keep them for a ſight, would not allow me any for the experiment. In this ſame perſon, though he had been as good a fellow all his life as any of the college, yet he had but one kidney, but that was recompenſed by its unuſual greatneſs; and being divided into ſeveral lobes, it had likewiſe two emulgent arteries, and two emulgent veins, and two ureters.

THE moſt obſervable thing in the courſe of his ſickneſs was, that within three weeks of his death he could not ſleep, unleſs his head and face were inclined forward; for if he lay on his back, he preſently ſtarted and awaked in a trembling and kind of convulſions, and ſaid it drowned him; whereupon opening his head, we found much water in it, which, as he lay on his back, fell down upon the medulla oblongata, and all the nerves; but inclining his head forward, it flowed toward the former part of his ſcull. And I have obſerved the ſame in one more, who could not ſleep, but with his head inclined forward very much; and after he died, the like quantity of water was found about the bottom of his brain.

THIS man had but one vertebral artery, but that was as big as two. The ſame I ſaw a little before in another, who died of an apoplexy, neither of which complained of any inconvenience in their head.

ABOUT a fortnight ſince we opened the head of a ſcholar, who being a very able and healthy youth, fell ſuddenly into a lethargy, and within a week's time died of it. His brain we found very firm, all the veſſels of blood going to and coming from his head very free and open, not any way obſtructed; but the ventricles of the brain were extraordinary full of a very clear water, and all the bottom of the brain and nerves drowned in the ſame water. The paſſage of the infundibulum was not obſtructed, but in the glandula

pituitaria

pituitaria there was a cavity not unlike that of the pelvis in the kidney, which cavity was filled quite up with a clear gelly to the bigneſs of a bean, ſo that it probably obſtructed the paſſage of the water out of the ventricles of the brain; whereupon it broke the pia mater at laſt, which encompaſſeth and incloſeth the brain about the ventricles, and ſo fell down outſide the brain upon the medulla oblongata and the nerves, whence came thoſe little convulſions firſt, and after by the increaſe of the ſame water, a lethargy; and this was the moſt probable reaſon we could find of his death and diſeaſe, there being no other way to convey away the water from the ventricles of the brain, but through that glandule.

AND here, next to the dropſies of the head and belly, I ſhall give you an account of a dropſy in the breaſt, which happened the laſt autumn.

A YOUNG gentleman, a fellow of All-Souls, having formerly weak lungs, being occaſionally at *London*, took a cold, and fell into a cough after it, but ſpit nothing but a thin frothy water, ſometimes a little ſtreaked with blood. Within three weeks he complained of a weight and heavineſs in his breaſt, which did very much oppreſs him, and made him ſhort-breathed, and about a week after could not lye on his left ſide; during which time he took electuaries againſt ſpitting blood and pectoral drinks, all to very little purpoſe, for his ſhortneſs of breath increaſed, and at laſt was not able to lye well on either ſide, but was forced to ſit up either in his chair or in his bed; for if he lay down to ſleep, within half a quarter of an hour he waked in a great oppreſſion, as if his breath had been taken away. I viſited him very often, being a friend of long acquaintance, and conſidering, that he had no kind of pleuriſy or inflammation of lungs preceding, and conſequently could have no empyema, and yet was not able to lye upon his left ſide without great heavineſs and oppreſſion, ſuſpected it might be water in his breaſt, eſpecially becauſe he ſpit nothing but thin watery liquor; and aſked of him, whether he would conſent to be opened, it being the only remedy, which gladly he would admit, if the doctors would conſent to it; but, it ſeems, they were not of the ſame opinion, and thought him too weak to endure it, if it were ſo, alledging the common ill ſucceſs of ſuch operations. So that he continued on his former courſe of phyſick about three weeks longer, all the while complaining for want of ſleep, and that he could not draw his breath, though he endeavoured with all his force, which was attributed to the weakneſs and foreneſs of his lungs, which they thought ulcerated. During the latter end of his life, he complained very much of cold, ſo that though he ſat by a conſtant great fire in a cloſe covered frame of wood, yet he could not get any heat. All this while he was moſt perfectly in his ſenſes, but at laſt ſpoke ſo low, that his words could not well be heard, unleſs one ſtood near him, which he attributed to his not being able to draw breath.

WHEN he died, inſtead of impoſtumes or ulcers in his lungs, we found the right ſide of the thorax as full of water, as ever it could hold: the other ſide was almoſt as full, but the lungs were ſo depreſſed and contracted by the preſſure of the water, that till two quarts were taken out, they could not well be ſeen; ſo that it was no wonder he could not draw his breath, becauſe his lungs could not be dilated. His lungs were not ulcerated, but only the pipes of the aſpera arteria full of thin frothy water, which I ſuppoſe had been aſſumed out of the water in the thorax.

I HAVE ſeen one ſince opened, who died of the ſame diſeaſe, in whoſe breaſt the lungs were ſo compreſſed by the water, that there is room enough for a knife to enter without danger of hurting, if they would conſent to be tapped. You need not take notice of this relation, when you come to *Oxford*; for when he was opened, it was agreed not to ſpeak any more of it.

AND this diſeaſe puts me in mind of another, *viz.* of a young healthy gentleman, Dr. *Willis*'s patient, as I remember the lady *Littleton*'s ſon, who, coming lately from *Tangier* to *London*, upon his arrival, was taken with a great pain in his ſhoulder, to which one of the *London* doctors applied a plaiſter (which ſince the gentleman underſtood by the apothecary to be *empl. vigon. cum mercur.*) which took away the pain in one night, but the next day he broke a vein, and ſpit blood in great quantity, and is now in a very ſad condition. His lungs were ſo ſound before, that he never remembered, that he had ſo much as a cough.

I OBSERVED lately in a man mentioned in Dr. *Willis*'s book of fevers, who had like to be ſtarved, becauſe he could not ſwallow, till he invented a whalebone with a button at the end, to thruſt his meat down: the fault it ſeems is in the lower part of the oeſophagus, or in the orifice of his ſtomach, for he is able to ſwallow down five or ſix good morſels (enough I ſuppoſe to fill all the oeſophagus) but then he can ſwallow no more, till with his whale-bone he hath thruſt down all that continued in his throat (as he calls it) into his ſtomach: the like he doth with drink, for he can take a whole beer-glaſs at a time, but it ſtays in his throat, till he forceth it into his ſtomach with his inſtrument. This the doctor thought might be cauſed by ſome tumor or ſchirrhus, near the mouth of the ſtomach; but lately it appeared otherwiſe, for being a while ſince in a fever, he could ſwallow down any thing, as readily as ever he could in his life; and ſo he continued during that ſickneſs; but as ſoon as he recovered, he loſt that faculty again, and is forced to uſe his whalebone as before.

THERE is one thing more, which I have begun to try, but have not had time to finiſh or duly conſider: it is the reaſon of the different colour of the blood of the veins and arteries:

arteries: the one being florid and purple red, the other dark and blackiſh; and therefore, in letting blood, the blood in the diſh, after it hath ſettled, that which is uppermoſt (I mean in healthy perſons) is always florid and finely red, and that under it always dark and black, which the apothecaries and ſurgeons very gravely call melancholick bad blood; whereas the purple part is the arterious blood newly come into the veins by anaſtomoſis, without any change; the black part is the arterial blood circulated through the habit of the muſcles, where without it loſeth many parts (*viz.* by lymphatick veſſels, *&c.*) before it is reſumed into the veins, and this I have tried to prove by two or three experiments.

FOR I opened an artery in a dog's thigh, and kept a porrenger full of the arterial blood, a day or two, and it continued to be of the ſame florid purple colour throughout to the bottom of the diſh. I opened preſently after the vein in the other thigh of the ſame dog, and kept it the ſame ſpace, and it remained black, except a little thin ſkin of redder blood on the top, which was of the very ſame colour as the arterious blood of the former diſh; which redder part, that it came out of the artery into the veins by anaſtomoſis, I am apt to believe, becauſe by ſyringing milk into an artery in the thigh or arm of man or beaſt, or into the emulgent artery (and perhaps into all the reſt) the milk will come forcibly and preſently out of the vein belonging to it, mixed with the blood, though not ſo perfectly mixed, but ſo as you may diſcern it very plainly; which difference of colour cannot be diſtinguiſhed ſo ſoon in the two bloods, becauſe they are of a nearer colour and mixture, but after ſettlement they ſeparate again, and the arterial part ſwims uppermoſt, becauſe of the difference of its part, and being more ſpirituous and lighter.

AND beſides it is obſerved, that the laſt blood, which comes out in letting blood, is always the moſt fine and purpureous, becauſe it was laſt ſupplied out of the arteries, and perhaps not ſpoiled of ſo much of its parts by the lymphæducts; which being ſtopped, as well as the veins, by the ligature, could not receive any more liquor. Now how much the ſeparation of the lympha from the arterial blood, before it is reſumed into the veins, may alter the colour of the venal blood, may be conceived, by drawing off or rectifying any liquor, which always renders that, which is left behind, more dark and groſs, ſo that the blood in the veins is like the caput mortuum, when the lympha is ſeparated.

AND here having mentioned anaſtomoſis, I cannot but tell you of an experiment or two concerning it.

IN the country, not far off, at a ſheep-ſhearing, a country man ſtanding by, the ſheep kicked the ſhears out of the ſhearer's hand, and it ſtruck the inſide of his leg, and cut the great artery in his leg, ſo that he loſt about three quarts or more of blood before the ſurgeon (*viz.* old *Day* of *Oxford*) could come. He uſed ſeveral things to ſtop it, but all to no purpoſe, ſo that he laid the wound open, and took up the artery, and made two ligatures, and cut off the artery between them, where it was opened; and the fellow came to town about a fortnight after a-foot, though it was nine miles off, and was as well as ever, only complained, that that foot, below the wound, was a little colder than the other, and a little benumbed for a day or two after, but ſince was as hot and well as the other.

AND ſince I have tried in ſeveral dogs, and in a man laſt aſſizes, and found an anaſtomoſis between all the arteries in the body, ſo that if one be ſyringed with milk, it will return and come out of all the reſt in the ſame part of that body; and the ſame we tried in the meſentery. We took a little branch of the meſenterical artery, and ſyringed it with milk, and it ran into all the arteries of the meſentery, which was the pleaſanteſt ſight I have lately ſeen in anatomy.

ONE thing more I tried, that the arteria hepatica goes into all parts of the liver; for if it be ſyringed, it will come out of all the lobes of the liver, if you cut off the edge of them. So that doctor *Gliſſon* was much miſtaken to affirm the contrary in his books; but I ſuppoſe he did not uſe ſyringes, without which anatomy is as much deficient, as phyſick would be without laudanum.

I HAD the opportunity lately to make uſe of millepedes. There was a child here in this town (a citizen's daughter) of ſix years of age, troubled exceedingly with ſore eyes, eſpecially one of them, which ſhe would not ſuffer to be touched or opened for eighteen weeks and more, nor could not endure the leaſt light, having a very ſharp fretting rheum in it, which did inflame all the cheek on that ſide, on which it fell. She had been touched for the evil, but received no benefit. I only gave her ſmall beer with millepedes bruiſed and infuſed in it, for a fortnight, to drink for her ordinary drink, and one gentle purge before the uſe of them; and ſhe is as well recovered as ever ſhe was in her life; the rheum is all gone; ſhe hath no blemiſh at all in them, only a little ſpeck upon the cornea, which ſince is worn quite off. And this I muſt acknowledge I received from the reading of your book concerning millepedes, for which I am aſhamed I have not returned my thanks ſooner.

DR. *Willis* a while ſince cured a child extraordinarily afflicted with the ſtrangury, only with millepedes in the like manner; ſo that in a ſhort time he could make water without any pain or anguiſh, which formerly he had not done in a great while.

I SENT Mr. *Hook* a while ſince ſomething concerning the difference and fabrick of the ſtomachs of creatures, which chew the cud, not knowing whether you were in town. It deſerves your conſideration, as well as any thing in the body of ſuch creatures, eſpecially ſince it ſo nearly relates to the beſt chemical proceſ-

ſes in diſtillation. But this I muſt tell you, what I had forgot to mention to him, that that part of the ſtomach, which I called the preſs, which ſqueezes the thin tincture into the next ſtomach, is not ſo hard, nor the ſeveral cakes between its ſeveral coats ſo dry this time of year, when they eat graſs, as in winter, when their food is drier.

DR. *Willis* is ſo taken with it, that he will make a lecture of it the next term, though he hath not been at leiſure yet to ſee them opened. My letters to Mr. *Hook* will inform you more fully.

BUT, Sir, I am very ſenſible, how much I have tired your patience already, aſſuring you, that I ſhould not have ventured to have given you ſo great a trouble, but that your accepting of my laſt letter invited me to write this. Therefore pray pardon this long ſcribble, and I ſhall remain,

SIR,

Your moſt obliged ſervant,

R. LOWER.

IF you write to me again, you may not direct it to me a ſtudent of *Chriſt Church*, for I have been put out of my place above a year and half ſince, for not being in orders, without which I could not keep my ſtudent's place, unleſs I had got a phyſician's place in the college, there being two allowed, but I had not the favour or friendſhip to obtain either; but I live in a chamber of the college, where, if you are pleaſed to honour me with a letter at any time, I ſhall moſt gladly receive it.

DR. *Willis* will ſend his book of the Diſeaſes of the Head to the preſs this winter, if he be not hindered and forced to defend his laſt. There is not a diſeaſe of the head, which he doth not excellently illuſtrate with very rare obſervations and caſes; ſo that it is pity the world ſhould be any longer deprived of them. When you come down, you may ſet it more forward; but pray take no notice, that you have ſeen any thing of them already, but only by hearſay and report.

Chriſt-Church, Oxon, June 8, 1664.

Moſt Honoured Sir,

I SHOULD have returned you my thanks ſooner, together with an account, how I have employed your laudanum; but that I hoped to have ſeen you before this time, either here or at *London*, and told you ſome other obſervations, which lately I have met with; but now I cannot defer it any longer, having promiſed to be in *Cornwall* after the Act, where, if I may ſerve you in any thing, pray let me receive your commands. I have ſome pieces of minerals, which I would have ſent you a-while ſince, but that Mr. *Croſſe* made me believe you were coming down. If I may know, whether they ſhall find you at *London*, I will ſend them by the firſt opportunity; otherwiſe I will leave them with Mr. *Croſſe* for you.

THE caſes, in which particularly I tried your laudanum, were, firſt, in one of ſixty years of age, who being cruelly troubled with the gout in his feet, and being impatient of any longer pain, applied repercuſſive plaiſters, which, within half an hour, repelled the humour from his feet into his heart and ſtomach; ſo that he had a very intermittent and trembling pulſe, and continually vomited, with a violent pain at his ſtomach; and when I came to him, I found him very weak, and in a cold ſweat. I gave him twelve drops of the laudanum, with one ſcruple of diaſcordium, and a draught of hot poſſet drink, boiled with camomile flowers, after it, and ſo left him, with little hope of ſeeing him again; but when I came two hours after, I found him very well, in a great ſweat, and a deſire to reſt; for he had not ſlept three or four nights before, by reaſon of his gout. He told me, that his pain went away from his heart and ſtomach, within half an hour, as ſoon as he began to ſweat; whereupon he continued in a ſlumber and a ſweat four hours longer (being a groſs bodied man) and the next day roſe, being neither troubled with gout or any pain elſe, and ſo he continued a quarter of a year, though his gout formerly continued upon him at leaſt a fortnight together: after which time, by taking cold in his feet, his gout returned upon him again, with the ſame violence as before; and, notwithſtanding I had told him the danger of uſing ſuch repelling plaiſters, yet being overcome with the pain, he uſed the ſame plaiſters again, and preſently after fell into the ſame ſymptoms, but was recovered again by the uſe of the ſame laudanum, beyond the hopes of all his friends, who deſpaired of his life; for as ſoon as he had taken it, he fell into a ſweat, and continued therein all night. In this man, as in all others, in whom I tried it, I always found it to cauſe ſweat extremely, but not ſleep, but rather a ſlumbering and deſire to reſt.

ON another I had occaſion to try it, who was ſick of a ſcorbutick fever, with a very great burning and heat of his body, without much thirſt or drineſs in his mouth, ſo that if he could ſweat, he hoped to be much better. His doctor had given him three nights following one dram of mithridate in poſſet drink, but without any ſweat after it; but he being ſent for out of town, the man deſired me to come to him, and I preſcribed him a clyſter, and afterwards at night gave him fourteen drops of the laudanum, with half a dram of diaſcordium, with a draught of hot poſſet-drink after it; and within a quarter of an hour he fell into a very great ſweat, and ſo continued till eight the next morning, not being much weakened by it: he ſlept pretty well all the while, ſo that he told me, his ſweat was not at all troubleſom to him. After he was out of his ſweat, he found his body very light and cool, his water became

became very good, and, whereas he had not ſlept in two or three nights before, but continually toſſed and tumbled, he reſted very well that night by fits, and found himſelf wonderfully eaſed and refreſhed, as he told me; and within two days after recovered very well; for which I had more thanks from the patient, than from the doctor.

A LITTLE before this time, I had an opportunity to try it in a gentlewoman very much weakened and tormented with thoſe pains of the ſcurvy in her belly, and at the pit of her ſtomach. She had took phyſick two years together from a country phyſician for fits of the mother, he having perſuaded her, that that was her grief: whereupon I took away the bay of caſtor and aſſa fœtida from her neck, which ſhe confeſſed did very much offend her, and made her much fainter; and the firſt night I gave her twelve drops of the laudanum in ſome conſerve of roſes, and ſhe ſlumbered all the night, and felt no pain at all, and in the morning awaked in a great ſweat: whereupon I left ſo much laudanum, mixed with conſerve of roſes, (for ſhe lived in the country) as ſhould ſerve her four nights more, and preſcribed her an electuary for the ſcurvy, to be taken twice a day, drinking after ſome wormwood wine, with ten drops of elix. proprietat. in each draught, and with theſe only things ſhe recovered ſo well in a fortnight's time, that ſhe told me, half a year after, when I ſaw her again, that ſhe was never better, when ſhe was a maid of twelve years old, though for the two laſt years ſhe never enjoyed one day without much pain and torment; ſo that ſhe ſaid, ſhe did commend my phyſick in all companies and places, where ſhe came.

AND ſince I have uſed it in the ſame pains of the ſtomach and belly with the ſame ſucceſs.

ANOTHER time I tried it in a gentleman, who had been troubled with a great flux, and a feveriſh diſtemper together, five or ſix days, whereby he was very much weakened. I gave him ten drops in conſerve of red roſes, which made him ſweat very well in the night, and very much abated his flame; but upon the ceaſing of his flux, he grew more feveriſh, ſo that I gave him another doſe, the next night, in the ſame conſerve; and it cauſed ſweat more largely, ſo that his flux quite ceaſed, together with his fever.

I HAVE uſed it in continual fevers with very good ſucceſs, by giving twelve drops in ſome temperate cordial, which always gave eaſe, by cauſing reſt and ſweats, though the patients were ever ſo hot and unquiet before.

I TRIED it once in a young country fellow, that was quite raving mad, without any fever or ſickneſs preceding, whom nothing could make ſleep. I gave ſixteen drops at a time, once a day, and at the ſame time uſed other remedies, *viz.* I let him blood at three or four ſeveral times, forty or fifty ounces of blood, and vomited him with ſtibium three or four times, and as often purged him with reſin of ſcammony, and extract of hellebore, and all this in a fortnight, giving him nothing all this while but plain water-gruel, and raw apples as many as he would eat; and for his drink only whey or fair water boiled with apples, and a little ſal prunel. diſſolved in it: beſides, I made him an iſſue in his arm, and another on the top of his head, where it is preſcribed; and with theſe things he recovered perfectly well within a fortnight, and continues as well as ever he was in his life. The very ſame I tried once ſince on another with the ſame ſucceſs; but the laudanum did not make them ſweat as it did all others, becauſe continually they threw off their clothes, and lay naked.

AND here by the way I muſt acquaint you with another accident concerning the ſame diſeaſe. Here was a young gentleman, who formerly being very far in a conſumption, had ſeveral iſſues made, to the number of nine, which, together with the uſe of aſſes milk, reſtored him pretty well; but going to *London* lately, met with ſome company, who perſuaded him to drink ſack with them, according to their own rate; ſo that in a ſhort time he was drunk, and that night was very ſick and feveriſh; ſo that all his iſſues were dried up, and the next day (though his feveriſh diſtemper was gone) yet he continued to talk as if he were yet drunk, which condition he remained in two or three days, till at laſt he became perfectly mad, and was thereupon brought down to *Oxford*, tied faſt in a coach, and here he remained in the ſame caſe about a week, and then he died; and notwithſtanding all things poſſible uſed, yet they could not make any of his iſſues to run again.

BESIDES the caſes abovementioned, I have uſed the laudanum very proſperouſly in pleuriſies, colicks, hyſterical fits and catarrhs, and once or twice in an erliſipelas; all which it wonderfully helped by large ſweats; ſo that if I had a quart of it, I ſhould not be able to keep it long; for thoſe, that have had the experience of it in one diſeaſe, think it will cure all. And now I am going into the country (pray pardon my boldneſs to requeſt ſo great a favour) if I might have another little bottle, I ſhould think myſelf more ſecure in my journey, and hope to be the better welcome where I go.

BUT I ſhall not trouble you any farther with the commendations of it, but only tell you in general, that I think it is the only medicine in the world, that can properly be called a ſudorifick; for it never fails to do it more or leſs, according as the body is more thin or groſs; and, which is the great conveniency of it, it cauſeth reſt and ſlumbering together, ſo that ſweating cannot be ſo troubleſom as otherwiſe it would be.

AND here I ſhould put an end to your trouble, but that I write to you but ſeldom, and cannot but tell you (at this opportunity) of an experiment or two I have lately ſeen or made.

THE one is of an ancient gentlewoman, Dr. *Willis*'s patient, which after a fever for two years ſince is troubled with a defect of

ſight every other day; for one day (be it never ſo ſerene and clear) ſhe cannot ſee at all, ſave only a glimmering light; the next day (be it ever ſo rainy, ſoutherly and dull weather) ſhe can ſee very well, and read the ſmalleſt print: the ſame day ſhe cannot ſee, ſhe is indiſpoſed in body and dull; the next day very clear and well, be it what weather ſoever; ſo that the doctor is curing her almoſt as one of an intermittent fever: what the ſucceſs is, you ſhall know hereafter.

THE other experiment is this: having occaſion to uſe ſome powder of vipers, I cut off their heads, and after touching one of the great teeth in the upper jaw (there being three on each ſide, contained in one ſkin, as it were in a ſheath) which you know they can erect and contract at pleaſure; every time the viper ſhot forth theſe teeth, there appeared upon the middle of it a little drop of liquor, partly yellow and green mixed, but very clear, not exceeding the head of a pin, juſt as it is on the ſting of a bee, when ſhe thruſts it out; and this liquor continually appeared at the end of the tooth every time I took up the tooth: whereupon finding the gall afterwards of the ſame colour (though it looks a little more green while it is contained in the bladder) I preſerved three of the galls to try them on a dog; which within three days I did; and having opened one of the dog's jugular veins, and made a ligature above the orifice, I dropped in two galls into the vein, and preſently compreſt the vein downwards towards his heart, that the galls might not run back again out of the orifice, but before I could drop the third gall into it, the dog cried out, and ſprawled on the table, and gaped in the greateſt agony imaginable; and beſides was in greater convulſions than a puppy dog is of nine days old, when the eight pair of nerves are tied in the neck; ſo that we thought the dog was almoſt dead, and layed him down on the ground, where he lay ſprawling for life, but within a quarter of an hour he recovered pretty well, ſo as to ſtand, and ſince is well again, and living. I have not yet tried, whether wounding a dog's ſkin, and dropping a drop of the gall into it, will kill him as if he were bit, as I believe it will; for I verily think the gall to be the ſame liquor with that, which drops from the tooth, though I did not try to find the ductus from the one to the other, which *Severinus* mentions.

ANOTHER experiment, which I intend to make as ſoon as I can get two dogs of equal bigneſs, is this; to let both bleed into one another at the ſame time, from the artery of one into the other's vein, *& ſic vice verſâ*, for an hour's time, till they have wholly changed their blood: and then to make the experiment ſurer, whether one dog can live with another's blood, I intend to take away as much blood from one dog, until he be quite faint and cannot ſtand, and then let the other dog's blood run into him, to ſupply the loſs, and ſee whether immediately he recovers his ſtrength again, and will live after it. And if this ſucceed, it may be tried on creatures of ſeveral bloods, as on a ſheep and a maſtiff; but howſoever if the blood of two ſeveral creatures cannot agree together, yet perhaps that of a ſheep may agree with a man's blood, and incorporate together, it being almoſt of the ſame taſte and nature, and not ſo rank as that of unclean creatures, nor altogether ſo fibrous as that of oxen: and if ſo, it may be improved in ſeveral caſes, *viz.* in great loſſes and evacuations of blood, to have it ſupplied from a ſheep, which may be dieted before, to make his blood more agreeable.

A LITTLE while ſince I ſyringed in about a quart of warm milk into a great dog (having firſt taken ſome blood from him to make room for the milk;) and though at firſt he ſeemed not much altered, but looked upon it very unconcernedly, while it was doing, yet within a quarter of an hour he began to groan exceedingly, and draw his breath with great difficulty, and ſeemed to be very much oppreſſed at heart, and ſtruggled very much; and, which was very remarkable, he drivelled at the mouth a kind of white liquor, as if he had been lapping milk. When we perceived him in this agony, we removed him from the table; but he was not able to ſtand, nor raiſe his body, but lay driveling and groaning, and almoſt preſently died; and as ſoon as we opened him, we found all the vena cava, the ventricles of his heart, and the great artery, full of blood, mixed with milk, as if both had been curdled together; for it was very faſtly mixed, ſo that it could not eaſily be ſeparated.

THERE are ſeveral other ſmall experiments in anatomy, which we have lately made, which at ſome other time I ſhould acquaint you with, if I were ſure of your pardon for giving you ſo great a trouble at preſent.

Sir, I remain

your moſt obliged ſervant,

RICH. LOWER.

I WOULD gladly ſend thoſe minerals to you, that I may have your opinion of them, and farther directions, before I begin my journey. What ſome of them are, I know not; but there is a piece or two of copper ore, as rich, I believe, as any in the world; and the gentleman, who ſent it me, hath a whole hill of the ſame metal, but is loth to have it known; for it being a royal mine, they may break up his land, and allow him no advantage for it: but if he might be aſſured, that he ſhould be paid for his ground, I believe, not only he, but ſeveral others, might do the king as much good, as if they had diſcovered another iſland in *America*.

Chriſt-Church, Oxon, July 18, 1664.

Honoured SIR,

BEING ſtayed in town longer than I expected, I had the happineſs to receive your letter laſt night, and I aſſure you I ſhall

ſhall make it my buſineſs to ſatisfy you in thoſe things you mention, both as to ſufficient quantities and information concerning them, or any other ſtrange mineral I can get. I forgot in my laſt to mention two or three very obſervable things, which you might have the opportunity to enquire of more fully when you come down to *Oxford*.

ONE is of Dr. *Priaux*, a doctor of divinity and prebend of *Saliſbury*, who being a while ſince here in town upon another occaſion, enquired of Dr. *Willis* concerning a ſtrange obſervation he had made of himſelf, *viz.* that his ſweat did always ſtain his ſhirt as blue as any thing could be died of that colour; and it is only the ſweat of his back, and no part elſe of his body, that hath the ſame effect. Dr. *Willis* told me, he ſaw the experiment of it ſeveral times here in town; and to be more certain, he made him put on a new ſhirt never worn before, and the next morning it was ſtained as blue, as if it had been died with indico, ſo that it could not be waſhed out. The doctor is an ancient man, yet very healthy, and of as ruddy and lively complexion as any man of thirty years.

THE other is of a lad here in town of fourteen or fifteen years old, the ſon of one *Franklin* a taylor, living over againſt *New-Inn Hall* in *Oxford*; who being taken with a ſuppreſſion of urine for a day or two, and in great pain, there met ſome of the neighbours in conſultation, amongſt whom an old woman gave her judgment, that it proceeded only from wind (as they think moſt diſeaſes do) and adviſed to give him a pipe of tobacco, which ſhe commended upon her experience to be very good againſt wind. Whereupon the boy began to take the pipe, but before a quarter of it had been taken, he called for a chamber pot, and made a great quantity of water, and was in perfect eaſe (but it ſeems the tabacco wrought otherwiſe beſides that by urine, it being the firſt pipe he ever took.) But about twelve hours after he was in pain again, and could not make water without uſing the ſame means, and ever ſince for theſe two years he continues in the ſame condition, only with this difference, that now he hath no pain though his urine be ſuppreſſed a whole day and night, ſo that his parents are careful to make him take tobacco every morning, midday, and at night; whereas being not provoked by any pain or oppreſſion, he would otherwiſe forget, not knowing the danger of its long retention, or elſe not liking the taſte of tobacco.

THE other relation was given me by a maſter of arts and fellow of *Magdalen* college, one Mr. *Mew*, a very honeſt and underſtanding perſon, who having travelled in the winter about Chriſtmas about forty miles in one day with his brother, and being to riſe early in the morning, he waked about five of the clock, and at firſt riſing in his bed, he was aſtoniſhed to ſee the bed within the curtains very light, as if there had been a candle in the room. There being a flame upon the coverlid as big as his hand, like the flame of burning aqua vitæ; which after he had contemplated a while, he put his hand to touch it, and the flame came from the bed to his hand, and there continued in the ſame faſhion without any heat. He ſtirred it with a finger of his other hand to and fro upon the palm of that hand, which took it up, until by degrees it leſſened and vaniſhed; and after his hand was very much drier than the other (for they were both in a ſweat, when they waked) he thinks, if he had not took it from the bed, the flame would have laſted much longer.

I SUPPOSE, if the boy before mentioned had taken fit remedies for his diſtemper before his bladder had been weakened by uſing only tobacco at ſet times, he might eaſily have been reſtored at firſt; but it is harder to perſuade mean people to take phyſick, than it is to cure their diſeaſes.

I HAVE received your laudanum, and return you my moſt hearty thanks for ſo great a favour; as ſoon as I have uſed it, I ſhall give you a farther account of it. In the mean time I take leave to reſt,

SIR,

Your moſt obliged, and
moſt humble ſervant,
RICH. LOWER.

Treemere, near *Bodwin* in *Cornwall*, Sept. 3, 66.

Honoured Sir,

YOURS of the 26th of June, after it had lain at Mr. *Croſſe*'s about three months, was occaſionally found and ſent to me in the country by a friend, together with another from Mr. *Mayer*, with a little box of braſs pipes; whereby I underſtand, that the account of bleeding one dog into another, which I ſent you before I left *Oxford*, had miſcarried, and that Dr. *Wallis* had not given you a full information how I performed it, for I tried it before him and ſeveral others with very good ſucceſs, and that ſeveral times, but not by that way of conveying the blood from one dog's jugular vein to the other by pipes, as we endeavoured to try, when you were there, and ſince often, but found it altogether impoſſible, becauſe the blood was apt to congeal in thoſe pipes, and ſo ſtop its own paſſage: but the way I did effect it ſince, was by bleeding from one dog's carotidal artery into the other dog's jugular vein, which by reaſon of the ſwift motion of the blood out of the artery will keep open its own paſſage. The exact way of doing it is this.

FIRST take up the carotidal artery, and ſeparate it from the nerve of the eighth pair, and lay it bare above an inch: then make a ſtrong ligature on the upper part of the artery not to be untied again; but an inch below, *viz.* toward the heart, make another ligature of a running knot, which may be looſened or faſtned, as there ſhall be occaſion, having made theſe two knots draw two threads under the artery, between the two ligatures, and then open the artery, and put in a quill, and tye the artery upon the quill very

very faſt by thoſe two threads, and ſtop the quill with a ſtick.

AFTER this make bare the jugular vein in the other dog, about an inch and half long, and at each end make a ligature with a running knot, and in the ſpace betwixt the two running knots, draw under the vein two threads more: then make an inciſion in the vein, and put into it two quills, one into the deſcendent part of the vein to receive the blood from the other dog, and carry it to the heart; and the other quill put into the upper part of the jugular vein, which comes from the head, (out of which the dog's own blood muſt run into diſhes.) Theſe two quils being put in and tied faſt, ſtop them with a ſtick, till there be occaſion to open them.

ALL things being thus prepared, tye the dogs on their ſide toward one another ſo conveniently, that the quills may go into each other (for the dogs necks cannot be brought ſo near, but that you muſt put two or three ſeveral quills more into the firſt two to convey the blood from one to another.) After that unſtop the quill going down into the dog's jugular vein, and the other quill coming out of the other dog's artery, and by the help of two or three other quills put into each other, according as there ſhall be occaſion, put them into one another; then ſlip the running knots, and immediately the blood runs through the quills, as through an artery, very impetuouſly; and immediately as the blood runs into the dog, unſtop the other quill coming out of the upper part of his jugular vein (a ligature being firſt made about his neck, or elſe his other jugular vein being compreſſed by one's finger) and let his own blood run out at the ſame time into diſhes, (yet not conſtantly, but according as you perceive him to bear it) till the other dog begin to cry and faint, and fall into convulſions, and at laſt dye by his ſide.

THEN take out both the quills out of the dog's jugular vein, and tye the running knots faſt, and cut the vein aſunder; which you may do without any harm to the dog, one jugular vein being ſufficient to convey all the blood from the head and upper parts, by reaſon of a large anaſtomoſis, whereby both the jugular veins meet about the larynx: this done, ſew up the ſkin, and diſmiſs him, and the dog will leap from the table, and ſhake himſelf, and run away, as if nothing ailed him. And this I have tried ſeveral times before ſeveral in the univerſity, but never yet upon more than one dog at a time, for want of time and convenient ſupplies of ſeveral dogs at once: but when I return (which I hope may be this autumn) I doubt not but to give you a fuller account, not only by bleeding ſeveral dogs into one, but ſeveral other creatures into one another, as you did propoſe to me before you left *Oxford*, which will be very eaſy to perform, and will afford many pleaſant and perhaps not unuſeful experiments.

BUT becauſe there are many circumſtances neceſſary to be obſerved on the performing this experiment, and that you may better direct any one to do it, without any danger of killing the dog, that is to receive the other's blood, I will mention two or three: firſt, that you faſten the dogs at ſuch a convenient diſtance, that the vein nor artery be not ſtretched; for then being contracted, they will not admit or convey ſo much blood: 2. That you conſtantly obſerve the pulſe beyond the quill in the dog's jugular vein (which it acquires from the impulſe of the arterious blood) for if that fails, then it is a ſign the quill is ſtopped by ſome congealed blood, ſo that you muſt draw out the arterial quill from the other, and with a probe open the paſſage again in both of them, ſo that the blood may have its free courſe again. For this muſt be expected, when the dog, that bleeds into the other, hath loſt much blood, his heart will beat very faintly, and then the impulſe of blood being weaker, it will be apt to congeal the ſooner, ſo that at the latter end of the work, you muſt draw out the quill often, and clear the paſſage, if the dog be faint-hearted, as many are, though ſome ſtout fierce dogs will bleed freely and uninterruptedly till they are convulſed and dye: but to prevent this trouble, and to make the experiment certain, you muſt bleed a great dog into a little, or a maſtiff into a cur, as I once tried, and the little dog bled out at leaſt double the quantity of his own blood, and left the maſtif dead upon the table; and after he was untied, he ran away, and ſhaked himſelf, as if he had been only thrown into the water: or elſe you may get three or four ſeveral dogs prepared in the ſame manner; and when one begins to fail, and leave off bleeding, adminiſter another, and I am confident one dog will receive all their blood (and perhaps more) as long as it runs freely, till they are left almoſt dead by turns, provided that you ſet out the blood proportionably as you let it go into the dog, that is to live.

3. I SUPPOSE the dog, that is to bleed out into diſhes, will endure it the better, if the dogs, that are to be adminiſtred to ſupply his blood, be of near equal age, and fed alike the day before, that both their bloods may be of a near ſtrength and temper. There are many things, which I have obſerved upon bleeding dogs to death, which I have ſeen ſince your departure from *Oxford*, of which I ſhall give you a relation in my next. In the mean time, ſince you were pleaſed to mention it to that honourable Society, with a promiſe to give them an account of this experiment, I could not but take the firſt opportunity to clear you from that obligation, and the more willingly, that I might expreſs myſelf grateful for all thoſe kind remembrances you have of me; and that I am,

Honoured Sir,

your moſt obliged, and

moſt humble ſervant,

R. LOWER.

Letters from Mr. Robert Hooke *to Mr.* Robert Boyle.

London, June 5, 1663.

Ever honoured Sir,

I HAVE put up and ſent the things you gave order for, together with four pair of gloves Mr. *Whit.* ſpoke for; and ſhould have come away my ſelf, but that having received a particular favour from the Society, and alſo an extraordinary injunction to ſee the condenſing engine in a little order againſt the next Wedneſday, I did hope you would be pleaſed to diſpenſe with my abſence from attending on you for two or three days longer, till the next Wedneſday be paſt, and that becauſe thoſe extraordinary days being holidays, you may perhaps have other avocations, eſpecially being but newly come thither. For I remember you were pleaſed to ſay, that you thought it would be a week before the ceremony of viſits would ſuffer you to ſettle about any buſineſs, and ſo ſhould have little uſe of me till then; and if your occaſions would permit a diſpenſation for my ſtay here any longer time, I ſhould endeavour to improve the time the beſt way I am able to ſerve you. But, Sir, I make it no further my deſire, than the convenience of your affairs permit, having wholly reſigned myſelf to your diſpoſal. Nor ſhould I have preſumed to have treſpaſſed your commands thus far, had I not thought, that the Society might have taken it a little amiſs, if, at the very next meeting, after ſo great an honour done me, I ſhould be abſent. There was nothing of experiment, but only a trial of the condenſing engine, which only held enough to ſhew us, that it would not hold long enough with that kind of cement we uſed; for after the air was condenſed into about half its dimenſions, it forced its way through the cement of the covers, though laid very thick in the joints. But I think that inconvenience will be eaſily remedied againſt the next day. Dr. *Bates*, I underſtand, was choſen by the council a member of the Society, who thereupon returned a great compliment, together with a preſent of ten pounds in new coined ſilver. There happened an excellent good diſcourſe about petrefaction; upon which occaſion ſeveral inſtances were given about the growing of ſtones: ſome, that were included in glaſs viols; others, that lay upon the paſture ground; others, that lay in gravel walks; which was known by putting a ſtone in at the mouth of a glaſs viol, through which, after a little time, it would by no means paſs. Next, the ſtory of a field's being filled with ſtones every third year, was confirmed by ſome inſtances. And that the ſtones in gravel walks grow greater, had been often proved by ſifting thoſe walks over again, which had formerly paſſed all through the ſieve, and finding abundance of ſtones too big to paſs through the ſecond time. Upon this, mention was made of the production of ſtones or lapidious concretions in the bodies of animals, and abundance of very ſtrange inſtances were alledged of the finding of ſtones in ſeveral parts of a man's body, as in the joints of his fingers and toes, and of other parts of his body; and it was generally agreed to by all, that thoſe people, that drink petrifying waters, are extremely ſubject to the ſtone. A place was mentioned in *Oxfordſhire*, where there is ſuch a water, and the people round about are extremely plagued with that diſeaſe. Mr. *Pell* and ſome others mentioned to have read ſomewhere an obſervation, that there were more ſuch concretions taken from one man, than the weight of his whole body amounted to.

MR. *Palmer* related a ſtory of a French phyſician (whoſe name I have forgot) who landing ſick at *Dover*, and taking a gliſter, voided an incredible number of ſmall and great cockle-ſhells. The matter of fact was confirmed by very many of the Society, who had either had very good relation of it, or ſeen ſome of the ſhells. Dr. *Charlton* added, that they had lain a good while upon ſea, and fed upon nothing but cheeſe (made of the milk of goats, which fed upon the mountains of *Bononia*, which are very full of ſuch ſhells) and brandy. Monſieur *Monconis* related a ſtory of a woman in France, who for a long time together every month voided the perfect bones of children *inſtar menſtruarum purgationum*, and has promiſed to ſend over ſome of thoſe bones. Another very ſtrange ſtory he related of a woman, who, being opened, was found to have a child petrified in a certain bag or appendix diſtinct from the uterus. Upon this ſeveral inſtances were added by many of the Society, about conceptions *extra uterum*. Dr. *Clark* told of a woman in *London*, who had carried a child eighteen years in her belly, and that ſhe had in the mean ſpace ſeveral children, one whereof he ſaid was eleven years old, when, by an impoſtume on the ſide of her belly, all the bones of the child came from thence. There were ſeveral of the Society, who had ſeen the bones, and talked with the woman, and Dr. *Clark* named the phyſician, who extracted thoſe bones. Collonel *Long* added, that a very noble lady, now alive, had told him, that a child remaining in her a good while, ſhe knew not how, ſhe was afterwards delivered of it *per ſedem*, and added, that he had ſeen the bones. Dr. *Charlton* upon this mentioned *Denſingius*'s little book about a petrified child found in the abdomen. To which Dr. *Clark* added, that the book was lately reprinted with the opinion of ſeveral learned men, moſt of which judge it a fiction, from ſeveral contradictions it contains. Dr. *Clark* likewiſe told a very odd ſtory, which the duke of *Albemarle* told him, of one of his officers, who was grievouſly tormented with the ſtone in his kidnies, of which he was perfectly cured merely by chewing tobacco; and that the duke commends it to the world, as an excellent remedy for moſt kind of diſeaſes. Sir *Robert Moray* brought in a petition, that was preſented to his majeſty, where-

in

in the petitioners deſired a patent for an invention of meliorating all kinds of grounds, ſo as to make the worſt to bear any kind of grain; and for another of making all kinds of fruits and flowers better, and the bearing plants more fruitful. Much was argued for and againſt the ſteeping of corn, and ſeveral ways were mentioned, by which it had been done, and with what ſucceſſes. It was generally concluded to preſerve corn from ſmut; ſeveral other ways were hinted of preſerving corn from ſmut. Mr. *Henſhaw* mentioned a way of ſhaking off the mildew from the ears of corn, by a rope drawn over the tops of them by two men at either end of it; which mildew was found to make the corn hide-bound. Mr. *Long* told of a ſtrange increaſe, that was received from corn ſown in bad ground with the huſks on. Mr. *Parker* affirmed, that there was a gentleman in *Suſſex*, that had a way of chuſing the ears of corn, whilſt in the blow, for his ſeed wheat, which is ſo excellent, that he will be bound to forfeit a great matter, if any of his ſeed corn yield ſmut, though ſown in the ſame ground ſeveral years. Mr. *Long* related the improving of many thouſands of acres of land, from ſixpence an acre to fifty ſhillings, by means of conveying water to overflow it. The drying and ſingeing, and ripening of corn was mentioned, as likewiſe the way of preſerving corn in the huſk for very many years. Several other obſervable particulars were mentioned. But they would be too long to trouble you with, you having already received too much by this long ſcribble from,

Honoured Sir,

your honour's moſt affectionate,

moſt faithful and moſt

humble ſervant,

RO. HOOKE.

I HAVE here incloſed a letter I received from the amanuenſis of the Society.

DR. *Kuffler's* wife has been here to enquire of me about an engine for diſtilling water, of which I told her I would acquaint you, when I next wrote.

SIR, my lord *Br.* and Sir *R. M.* preſent their humble ſervice to you. And Sir *R. M.* ſays, he has a quarrel with you, becauſe you would not let him ſee you, before your leaving the town.

I HAVE not been able to meet with doctor *Sydenham* all this morning, and ſo cannot ſend any of the ſage, for there was none left at my lady's houſe.

[About July 1663.]

Right Honourable,

I DID expect and hope, that you would have been in *London* before this; nor are your friends at *Greſham* college leſs ſollicitous after your return; I being aſked by every one almoſt, when you would be here. There was but little done this laſt Wedneſday, becauſe of ſome papers which were read, which took up almoſt all the time. The one was ſent in from Sir *Paul Neile*, being an account of his way of making, ordering and bottling of cyder, and his judgment of the cauſe of the fermentation of it, *&c.* wherein indeed were very many new obſervables, though ſeveral of them were contradicted by Mr. *Waller* and ſome others, Sir *P.* being very much againſt the fermenting of cyder very much; and Mr. *Waller* and ſome others of the contrary opinion. There was likewiſe read a relation ſent from the coaſt of *Coromandell* in the *Eaſt-Indies*, by a perſon of credit, and one, who had lived a governor there above eleven years. The ſum was this, that for three or four months, in the ſummer time, the wind did all day, from eight in the morning to four in the afternoon, blow ſo extremely hot from the land, that the people are hardly able to endure it, but are fain to ſit in tubs of cold water, up to the neck, to preſerve themſelves from being ſtifled; that every night the wind blows directly contrary, namely, from the ſea, with as great an exceſs of cold. But this is not ſo ſtrange, becauſe it happens in ſeveral other parts of the world; but what he added further is ſufficiently ſtrange to an European, *viz.* that their way to preſerve their drink cold in this extremity of heat, was to put it up in their earthen veſſels (what form they are of I know not) and expoſe the bottle, hung by a ſtake, or the branch of a tree, to the ſcorching ſun and ſuffocating winds; for by that means they find the contained liquor, at four in the afternoon, exceſſively cold, and extremely pleaſant and refreſhing; nor would the relator himſelf, nor any that he had heard of, venture to give a reaſon for it. We made a trial of monſieur *Zulichem's* experiment, where indeed it ſucceeded ſo far, that with the pumping, that was uſed about it, the water would not deſcend, though I am very confident, if the pump had been longer plied, the event would have been much otherwiſe; and we ſhall this next week try with a pipe of five or ſix foot long, whether it will remain ſuſpended or not. We have lately likewiſe tried two other experiments: the one was, there were two bolt-heads full of water inverted into reſtagnating water, out of which, when the air was extracted, there remained in each a ſmall bubble at the top: into the place of one of the bubbles of extracted air as much common air was put, and then both of them ſet aſide and obſerved. The event was, that both the bubbles vaniſhed into the water, but that of the common air remained longeſt. Since that, we exhauſted the air out of one of thoſe bolt-heads, and put common air in the place of it; then the other was filled with common water, and a bubble of air, equal to that in the other, was put into it, and it was found, that the air was vaniſhed into the exhauſted water, but that the other remained almoſt intire in bulk.

bulk. I am taking order about the engraving of my microſcopical pittance, which I hope will be very well done. I this week obſerved a creature newly come out of the egg, which by comparing it with the biggeſt old one I have ſeen of that kind, I found to be above 130000 times leſs than the bulk it was likely to come to, if it ſurvived; of which, I believe, we ſhall not find many other examples in nature. I have now procured the new Jamiaca nuts; and had I not been advertiſed, that your return would be either this Saturday, or the following Monday, they had been ſent you by,

Right honourable,

your honour's

moſt affectionate

moſt faithful and

moſt humble ſervant,

ROB. HOOKE.

I HAVE ſent a ſmall bag of the nuts, underſtanding by Mr. *Wh.*'s letter, that you will not be here till Thurſday. The two foot perſpective I alſo ſent, the box was delivered to the carrier the laſt week before he went away. Mrs. *Kuffler* is very earneſt to know, when you will give order about the engine, and ſeems to be a little angry, and wonders you ſhould be worſe than your word, and ſuch kind of ſpeeches; though I had given her the reaſon, why you could not do it before you went hence.

[July , 1667.]

I WAS very ſorry to find the coach return from *Leez* without bringing you in it; but I am glad however to hear, that your return will be the beginning of the next week. There was but little done this Wedneſday at *Greſham* college, much of the time being taken up in obſerving the experiment, which was made with the glaſs tubes of forty five foot high, in which there was little remarkable, but what you will eaſily predict muſt neceſſary follow; that is, that the water, upon the turning off the lower ſtop-cock, fell down to between thirty two or thirty three foot from the bottom; that as it fell, and a good while after, abundance of bubbles appeared near the top of the water; that as thoſe bubbles riſe for a good while, ſo all that while the water continued to deſcend a little; inſomuch, that when we were coming away, I obſerved it to be about 29½ foot high, and it is likely it would afterward deſcend lower. That one of our tubes conſiſting of ſeveral pieces, leaked. That upon theſe obſervables, ſeveral things are ordered to be tried the next day; as firſt to fill the tube with exhauſted water to * * * the bubbles that riſe; to make a device to cloſe the ſtagnant water ſo, that the air may not get in: to make the other tube tight, and ſo to join both together by a bended pipe at the top, and the like. After we returned from this experiment, Sir *R. Moray* preſented the Society with an engine ſent to them by prince *Rupert*; being for raiſing water, ſuch a one as, I am ſure, you have ſeen and taken notice of in *Scottus* his mechanicks, whoſe contrivance is, continually to raiſe water, by turning round a cylinder with a ſliding board in it, included in another hollow cylinder or barrel. The engine has not been tried, but it will be the next Wedneſday. But I find, that it goes exceeding hard with the ſeveral grating and ſliding motions, that it has, ſo that it is more likely to prove a pretty curioſity than a uſeful engine. But this gave an occaſion of producing the definition or deſcription of the marquis of *Worceſter*'s water-commanding engine, which is ſo purely romantick, that it would ſerve one rarely to fill half a dozen pages in the *Hiſtory of Fortunatus his wiſhing Cap*. A tranſcript of ſome of the moſt obſervable paſſages, becauſe I could not procure the book itſelf to ſend you, I have here encloſed, which if it ſhould chance to perform but the leaſt part of what is therein ſpecified, my lord *Brereton* is likely to pay 5 *l.* towards the revenue, that is to accrue thereby to the marquis, he having wagered ſo much againſt him. I was ſince my return to *London* to ſee this engine, where I found *Caltrop*, his chief engineer, to laugh at it; and as far as I was able to ſee of it, it ſeemed one of the perpetual motion fallacies. Of which kind *Caltrop* himſelf, and two or three others, that I know, are labouring at this time in vain, to make, but after ſeveral ways; and nothing but coſtly experience will make them deſiſt. We had next Sir *R. Moray* and Mr. *Oldenburg*'s relation of the excellent French lithotomiſt, which gave occaſion to Sir *Anthony Morgan* to relate the hiſtory of an Iriſh lithotomiſt that does the ſame thing, though, if it be according to his deſcription, by a more eaſy and expedient way. And Dr. *Whiſtler* affirmed the ſame to be done by a Scotchman, and calls it cutting by the gripe, the more perfect relations of which are to be given in by thoſe perſons in writing. Sir *R. Moray* likewiſe produced the ſtone cut out of the heart of the Scotch nobleman I formerly told you of; it was very hard, and of a miſhapen figure, and looked in colour like a flint. Mr. *Pell* brought in a bag of ſand, which he affirmed would be baked into a ſubſtance like Flanders jugs. It looks and feels like clay beat to duſt, and I gueſs it to be a ſubſtance between both; that is a ſandy clay, or clayiſh ſand. I cannot find any peculiarity in it with a microſcope. Dr. *Charlton* gave a deſcription of *Aubery* in *Wiltſhire*, which ſeems indeed by his relation a very ſtrange piece of antiquity, and more admirable than *Stoneheng*, which he hopes to make an argument to confirm his hypotheſis about that *Chorea Giganteum*. Dr. *Pope* is going for *Italy*, but I ſuppoſe will not be gone before your return, who will be very glad to be charged with inquiries by you. Some things about the growth of ſalmons were handed to and fro, ſome

flatly contradicting others. The laſt thing we had was a relation of Sir *W. Petty*'s ſhip new modelled, upon which he has already laid 50*l.* that it ſhall go ſafe to *Holy-Head* and back again; and it was ſet forward on that attempt before he writ that letter, which was read. I have ſent you likewiſe a new book of philoſophy, but I fear it contains but little of that ſubject worth any thing. I but juſt now received it, and have not had time to look it over. There is nought elſe worth your knowledge, only this encloſed, which I ſuppoſe contains ſeveral things, which ſhould elſe have been ſent you by

Right honourable,

your honour's moſt affectionate,

moſt faithful, and

moſt humble ſervant,

R. HOOK.

Friday 10 in the morning, from *Pall-Mall*, [1663.]

Honoured SIR,

I HAVE not received any of your commands ſince I took my leave of you for *London*. I know not, whether there has any thing miſcarried, nor have I written any thing ſince this day ſev'night, there having happened little or nothing conſiderable in that time; only I ſhould have ſooner given you an account of an interview I had of Mr. *Hobbes*, which was at Mr. *Reeve*'s, he coming along with my lord *De.* to be aſſiſtant in the chooſing a glaſs. I was, I confeſs, a little ſurpriſed at firſt to ſee an old man ſo view me and ſurvey me every way, without ſaying any thing to me; but I quickly ſhaked off that ſurprizal, when I heard my lord call him Mr. *H.* ſuppoſing he had been informed, to whom I belonged. I ſoon found by ſtaying that little while he was there, that the character I had formerly received of him was very ſignificant. I found him to lard and ſeal every aſſeveration with a round oath, to undervalue all other men's opinions and judgments, to defend to the utmoſt what he aſſerted though never ſo abſurd, to have a high conceit of his own abilities and performances, though never ſo abſurd and pitiful, *&c.* He would not be perſuaded, but that a common ſpectacle-glaſs was as good an eye-glaſs for a thirty ſix foot glaſs as the beſt in the world, and pretended to ſee better than all the reſt, by holding his ſpectacle in his hand, which ſhook as faſt one way as his head did the other; which I confeſs made me bite my tongue. But indeed Mr. *Pell*'s deſcription of his deportment, when diſcourſed with about mathematical demonſtrations (which he gave the laſt Wedneſday) ſurpaſſes all the reſt. There was very little done this week at *Greſham* college, the whole ſtay being not much above an hour. My lord *B.* Sir *R. M.* and Monſieur *Zul.* were very inquiſitive when you would return. There was an account read of Monſieur *Le Fevre*'s trial to volatilize ſalt of tartar with burnt alum, which you have long ſince heard. Monſieur *Zul.* tried his own experiment, but it ſucceeded not, though he confeſſed the engine was very tight, and it will be tried again the next day according to his ordering. The accounts, which I acquainted you with the laſt week, were not brought in as was expected. Sir *R. M.* gave in the meaſure of an infant of ſixteen weeks old, which was ſent him out of Scotland, a pattern whereof I have here encloſed. There is a meeting of the council upon Monday, where your preſence is much expected and longed for. There is very little in Dr. *Power*'s microſcopical obſervations but what you have ſince obſerved; only there is a pretty experiment he tried with the leeches in vinegar, that ſurvived the freezing of the vineger they lived in; and another pretty experiment he has in his philoſophical reflections upon his obſervations, which is of making a certain kind of coals kindle into a fire and flame, by throwing water on them, when newly dug out of the mine. I am ſorry to ſee, that he intends to publiſh ſeveral experiments about colours, which I am confident might be originally yours. He will likewiſe publiſh the experiment of freezing an eye, to find the ſhape of it, whoſe invention he aſcribes to another. There is not much more beſides, that is very conſiderable in it, and therefore I ſhall refer the further account of it till your return, till when I ſhall keep the book by me. I have made a microſcope object glaſs ſo ſmall, that I was fain to uſe a magnifying glaſs to look upon it, but it did not ſucceed ſo well as I hoped; but I ſuppoſe it might be, becauſe this being the firſt I had made, the tool was not very true, nor my hand well habituated to ſuch an employment. And therefore I deſpair not of better ſucceſs in my next attempt. Mr. *Lower* was to have waited on you, and was ſorry to miſs you here in town. He had Dr. *Willis*'s ſervice to have preſented to you, whoſe book he tells me is within a little while to come forth, and he added, that Dr. *Wren* had drawn the pictures very curiouſly for it; and I am glad to hear it will afford ſuch conſiderable diſcoveries, which I doubt not but you know. I queſtion not; but that Mr. *Oldenburg* has acquainted you with the news, that is extant, in this encloſed, and therefore I ſhall not trouble you with that particular. Nor has there occurred any thing elſe ſince my coming worth your knowledge; otherwiſe it ſhould have been ſent you by,

Honoured Sir,

your moſt affectionate,

moſt faithful, and

moſt humble ſervant,

ROB. HOOKE.

I SUPPOSE Mr. *Murray* has told you, that Mr. *Nicolls* deſires to ſpeak with you.

I JUST now received a letter from Mr. *Whit.* to ſend down the horſe; but it is ſo lame, that it is altogether unable to perform a journey.

Aug. 25, 1664.

SIR,

I HOPE this will find you ſafe returned to *Oxford* after your Weſtern journey, which I underſtood you intended upon Thurſday laſt to begin, or elſe I had before this ſent the paper you gave me charge of; but being unable to do it time enough the laſt week, by reaſon I could not ſpeak with my landlord, I have delayed it till the latter end of this, as ſuppoſing your return to *Oxford* could not be ſooner. I have likewiſe here encloſed an Iriſh letter, which I received from my lady, and one from Mr. *Oldenburg*, which he gave me this afternoon. I have ſince your departure been on the top of *Paul*'s ſteeple, in order to make ſeveral experiments, which will be proſecuted this week; but it being the firſt time I had been there, I could not be ſo well provided with an apparatus as I found was requiſite; and therefore I was fain to return with only making ſome obſervations. One was, that a pendulum of the length of one hundred and eighty foot did perform each ſingle vibration in no leſs time than ſix whole ſeconds; ſo that in a turn and return of the pendulum, the half ſecond pendulum was ſeveral times obſerved to give twenty four ſtrokes or vibrations. Another was, that this long pendulum would ſometimes vibrate very ſtrangely, which was thus. The greateſt part of the line, by gueſs about ſix ſcore foot of the upper part of it, would hang directly perpendicular, and only the lower part vibrate, at what time the vibrations would be much quicker, and this though there was a weight of lead hung at the end of the ſtring of above four pound weight. In another place of the Tower, where I had very clear perpendicular deſcent, I with a plum-line found the perpendicular height of it two hundred and four foot very near, which is about ſixty foot higher than it was uſually reported to be. In which place I ſhall, with ſome other company, this week try the velocity of the deſcent of the falling bodies, the Torricellian experiment, and ſeveral experiments about pendulums, and weighing. I have ſince the laſt week almoſt brought my treble writing inſtrument to be practicable, inſomuch, that I hope to make it as eaſy to write three copies as one. I have made ſeveral trials of it, and have writ three ſides together very well, but yet I hope to make it better. We yeſterday made ſeveral odd experiments about the velocity and ſtrength of a bullet ſhot out of a carbine, whereof ſome circumſtances will certainly ſeem very odd: one of which was, that the bullet pierced through a board three inches thick, and yet broke not a very ſmall weak piece of white thread, that held that barred againſt the force of the bullet: a ſecond was, that though two of theſe ſmall threads were tied acroſs the noſe of the piece, ſo as one would have thought it impoſſible, that the powder ſhould have been diſcharged without breaking thoſe threads; yet, notwithſtanding, both the powder and bullet were diſcharged out of it, without doing the thread any other harm, than only a little ſinging it, which made me a little reflect upon the ſtrange effects I had obſerved in thunder and lightning. And this puts me in mind of an excellent account we had of a prodigious ſtorm, that lately happened in *Italy*, between *Venice* and *Padua*, which I ſhould have added, but that I ſuppoſe Mr. O. has given you a copy of the letter. My lady I underſtand does to morrow intend to go towards *Leez*. I was among the bookſellers this afternoon, but found nothing new.

MR. *Faithorne* has promiſed me to make all poſſible ſpeed with that you ordered him, but he does deſire a little farther directions. Whilſt I was writing this, Mr. *Faithorne* has ſent me the ſketch, which I have encloſed, to ſee whether you approve of the dreſs, the frame, and the bigneſs; what motto or writing you will have on the pedeſtal, and whether you will have any books, or mathematical, or chemical inſtruments, or ſuch like, inſerted in the corners, without the oval frame or what other alteration or additions you deſire. It is almoſt ten o'clock, and therefore I hope you will excuſe this ſcribbled paper, and the abruptneſs, wherein I am forced to ſubſcribe myſelf,

Moſt honoured Sir,

your moſt humble, and

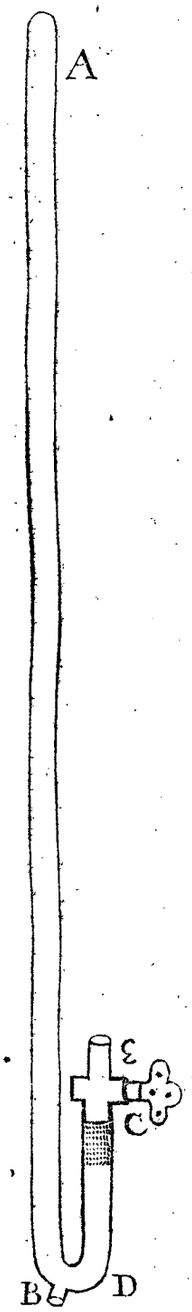
moſt faithful ſervant,

R. HOOKE.

Thurſday-night, [Sept. 8, 1664.]

Moſt Honoured Sir,

I MUST in the firſt place return you my moſt humble acknowledgment for the honour and favour you have been pleaſed to oblige me with in your letter, which, to my power, I ſhall ever be ready to expreſs my ſenſe of. As for the experiments, that I gave you an account of, that I intended to proſecute on the top of St. *Paul*'s, I have, by reaſon of ſome miſcarriages, only proceeded thus far, that drawing up a mercurial tube, made, after the form, and ordered according to the manner here deſcribed, [A B a glaſs pipe, about three feet long, whoſe end A was cloſed, and the other open at C, and bended in the manner of a ſyphon, as appears in the figure; into C was cemented a ſmall ſtop-cock, to open and ſhut at pleaſure: and juſt in the bending of the pipe, was drawn a ſmall hole B, by which the whole inſtrument, when the cock was ſtopped, was filled carefully top-full with quickſilver; and then the hole was very well ſtopped with a ſmall plaiſter of cement, ſpread on leather, and bound on when hot: then, by inverting the tube, and opening the cock, the quickſilver would fall to its uſual ſtation; then, by turning the cock, this inſtrument became portable, and might eaſily be carried up and down, without any danger of loſing the mercury, or admitting any air; for the mercury would not at all vibrate, which, without the cock, it was ſo very apt to do, that without a great deal of care and trouble, it could not be ſtirred or moved, but the air would break in, and get above the mercury,] I found the quickſilver to be at the top, full half an inch lower than it was at the bottom. The manner of making which experiment was thus. The ſteeple being without any kind of lofts, but having only here and there ſome rotten pieces of timber lying a-croſs it; I cauſed a rope to be ſtretched quite croſs the top, and faſtned, in the midſt of which I fixed a pully, through which I let down the ſtring and weight to the bottom (for only in the very middle of the ſteeple was there a broad clear paſſage from top to bottom) and to this I could not at the top approach within eighteen foot:) having thus let down the rope, thoſe that were at the bottom hung on this mercurial tube (which I had exactly marked, and ſtopped, and ſet ready before I went up) a large weather-glaſs (which moved by the rarefaction and condenſation of the air only, which I had likewiſe marked and ſtopped) and a ſealed thermometer, which I had likewiſe marked. After theſe were drawn up, and, by a contrivance of another pully, I had drawn them to me, I found the thermometer, the glaſs being but thin, broken. The quickſilver, upon opening the cock, I found to fall very conſiderably, which ſince, upon meaſuring, I find $\frac{25}{32}$ of an inch: the weather-glaſs I found to be riſen ſomewhat more than two inches: then cloſing them again, I cauſed them to be let down, and giving them charge not to let it quite down till I called to them from below, I went down myſelf, and found, upon opening the mercurial tube, that it roſe exactly to its firſt ſtation; as did alſo the weather-glaſs. I had deſigned to have tried many others then; but the night came ſo faſt, that I could hardly ſee to get up again, and give order for the clearing of the lines. But I deſign, within a day or two, to make ſeveral other experiments. We have ſince the laſt made very few experiments worth your hearing, only trying the velocity of ſeveral ſmall balls of bees-wax, which deſcended in a glaſs pipe filled with water, and divided into inches, we found, by ſeveral trials, that it moved almoſt the whole length of 81 inches downwards, with very near an equal velocity, only ſomewhat accelerated towards the bottom, if the balls were very ſmall; but if they were any thing big, we found them much ſlower towards the bottom; the reaſon of which was accidental, and would not have happened, had not the lower end of the tube been ſomewhat leſs than the top; but thoſe ſmall ones, whoſe motion the narrowneſs of the tube did not at all or very little ſtop, were obſerved for near twenty inches, to keep even pace with a half ſecond pendulum, moving juſt an inch every vibration, but beyond twenty they grew ſwifter. I have conſulted with Mr. *Faithorne*, who is ready to do any thing he ſhall be directed, and has deſired me to contrive it, how it will be moſt convenient, and he will punctually follow directions. I have made a little ſketch, which repreſents your firſt engine placed on a table, at ſome diſtance beyond the picture, which is diſcovered upon drawing a curtain. Now, if you think fit, I think it might be proper alſo to add, either by that, or in the corners A or B (where alſo you may have any other inſtruments, or any thing elſe added, if you think fit) your laſt emendation of the pneumatick engine. One word or two I beſeech you of directions in this particular. I ſent by the Wedneſday's coach a ſmall weather-glaſs, and Dr. *Henſhaw*'s book, which is printed in *Ireland*, wherein he has mentioned you; and he has added a preface, and altered many things in his book. I hope, by the next poſt, to ſend you a farther account



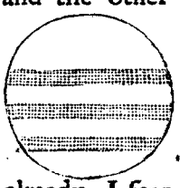
of my trials on *Paul*'s: in the mean time, and ever, I muſt remain, and in great haſte ſubſcribe myſelf,

Moſt Honoured Sir,
your moſt humble, and
moſt faithful ſervant,
ROB. HOOK.

Greſham-College, Sept. 15, 1664.

Moſt Honoured Sir,

I RECEIVED the honour of your letter, and ſhall endeavour to ſee your deſires therein moſt punctually performed. As for the experiments on *Paul*'s, I have, ſince my laſt, made ſeveral other trials, which, I ſuppoſe, will not be unwelcome to you. Upon Tueſday, the lord *Br.* Sir *R. M.* and myſelf, were again at the ſame place, and examined the vibrations of a pendulum of two hundred feet long: the line was a treble hard twiſt, one about the bigneſs of a very ſmall gooſequill; the weight of it ſomewhat more than half a pound; at the lower-end of this was hung a weight of lead of 28 pound averdupois; this we found, when each vibration was about 12 or 14 feet, to make one ſingle vibration in 7 ſeconds and almoſt an half; that is, we found it to make 13 vibrations in 100 ſeconds pretty exactly; this we repeated ſeveral times, and found the ſame; then we ſuffered it to vibrate not above a foot, and we found them ſomewhat quicker; that is, 13 vibrations in 98 ſeconds. After this, we tried the ſame experiment, with a ſmall wire about a 32 part of an inch in diameter, to which we hung the ſame weight, and found the vibrations very much the ſame, but ſomewhat ſwifter and longer. This we tried, both with longer and ſhorter vibrations, and found them to correſpond with the former. On Wedneſday we made farther trials at the ſame place, and that was with a very curious beam we brought two weights to an equilibrium at the top of the tower, the one was a 15 pound weight of braſs, the other, that counterpoiſed it, was a company of ſmaller braſs-weights tied in a ſmall canvaſs bag together with the former ſmall line, by which, after we had hung the beam over the very middle of the ſteeple, we let down the bag of weights to the bottom, and with long adjuſtening we found, that the counterpoiſing bag and ſtring was grown lighter by a drachm. And this was very obſervable, that though the weight hung at that diſtance, and though, by ſome misfortune, the cock of the beam was miſſing, yet was the beam ſo tender, that a very ſmall weight, as ſome very few grains, would very ſenſibly turn it, and, when brought to an equilibrium, the beam would vibrate, as if it only had a pair of ſhort ſcales hanging to it. The cauſe of this phænomenon, *viz.* why the bag, that was let to the bottom, was found lighter, was judged to proceed from the denſity of the air at the bottom, which I acquainted you with, as I think, in the laſt letter: but we repeated the Torricellian experiment ſince, and found the difference ſome very ſmall matter leſs than half an inch. But our weather-glaſſes again failed us, as did alſo our inſtrument for the velocity of falling bodies: yet ſome we made, but thoſe ſo imperfect, that I ſhall not, till we make them more accurate, trouble you with an account of them; nor of ſome other attempts, till I have farther perfected them. We made, on Wedneſday, a very conſiderable experiment with powder; for incloſing only ſix penny-weight of P. *Rupert*'s powder in one of our cylinders (the faſhion whereof you, I doubt not, do well remember) and having very firmly ſcrewed it up, it was fired by a ſmall touch-hole, no bigger than a pin's head, which was drilled through the ſide of it: the effect was, that it broke the cylinder (which was every where very ſound, and made of very tough iron, and, in the thinneſt place, where it broke, was above half an inch, and in ſome near three quarters thick, ſo that I can hardly think the weight of 100 tun hung at it, would have been able to have pulled ſo much iron in ſunder point blank) in four (if not more) pieces, and that in ſuch places, where there was no beginning of a crack, with a moſt hideous crack and noiſe, like a ſmall field-piece of ordnance: the ſide in which the touch-hole was made, we found intire; nor was that hole any thing widened by the eruption of the fire. We ſhall yet again make ſome more trials of it before we leave it, that ſo we may bring it to ſome certainty and theory. I begin now to make uſe of a 36 feet glaſs, and hope ſhortly to make ſome obſervations, which I hope may be worth your knowledge, the Society having very freely and willingly furniſhed me with tubes, according to my directions; as alſo with an exact time-keeper, which, I have ſome reaſon to believe, ſhall not be much excelled by any whatever. But theſe are not yet completed. In the mean time, I find very much is to be diſcovered with theſe long glaſſes, which none of the ſhorter I have yet ſeen would help one in; and this both in the moon, and the other planets; and, looking this night on Jupiter, I found its form ſomewhat of this in the margin; of which I never ſaw it before, but only in Mr. *Reeve*'s threeſcore feet glaſs ſome-while ſince. But I have already, I fear, given you too much trouble with this tedious ſcribble; and therefore ſhall not, at preſent, add thereunto, by relating my deſigns and intentions, whereof I may more ſeaſonably hereafter inform you, when experiment has been made; it being my deſign to acquaint you chiefly with matter of fact: and this method I am ſure I ſhall not break, when I aſſure you, that I am,



Moſt Honoured Sir,
your moſt faithful, and
moſt humble ſervant,
R. HOOKE.

Moſt

[Oct. 6, 1664.]

Moſt honoured Sir,

I HAVE forborn all this time to give you the trouble of one of my ſcribbles, that I might have been able to have made it ſomewhat the leſs troubleſom, by giving you an account of ſome further trials made on Paul's. But ſuch have been the diſappointments, from winds, and rains, and divers other accidents, that we have not as yet made any further proceeding in that buſineſs. The magnetical experiments alſo which you were pleaſed to propound ſhould long ere this have been tried, had not the multitude of iron bars, wherewith all the top ſtone, and indeed all the ſtones of the ſteeple are tied together, wholly ſpoiled that deſign: and indeed I fear (the winter weather coming on ſo faſt) we ſhall hardly make any more trials there before the next ſpring. Concerning hygroſcopes I have lately made ſeveral trials, and among the reſt I find, that there is no body ſo ſenſible of the changes of the air, as to drineſs and moiſture, as the beard of the ſeed of geranium moſcatum, and of ſeveral other ſorts of large cranes bill, a vegetable ſubſtance, that has not, that I know of, been taken notice of by any writer or other perſon whatſoever; and I have found it, if the ſeed be perfectly ripe before it be gathered, to be indeed the moſt proper body to make a hygroſcope withal. I have alſo, ſince my ſettling at *Greſham* college, which has been now full five weeks, conſtantly obſerved the baroſcopical index (the contrivance, I ſuppoſe, you may remember, which ſhews the ſmall variations of the air) and have found it moſt certainly to predict rainy and cloudy weather, when it falls very low; and dry and clear weather, when it riſeth very high, which if it continue to do, as I have hitherto obſerved it, I hope it will help us one ſtep towards the raiſing a theorical pillar, or pyramid, from the top of which, when raiſed and aſcended, we may be able to ſee the mutations of the weather at ſome diſtance before they approach us, and thereby being able to predict, and forewarn, many dangers may be prevented, and the good of mankind very much promoted. We have at the Society made lately ſeveral trials about the deſcent of variouſly figured bodies through the water, and amongſt the reſt (which are not yet brought to an exactneſs, and therefore I ſhall not till then trouble you with them) there was this very conſiderable diſcovery (for I do not find it was diſcovered, or ſo much as ſuppoſed before, but rather the clean contrary believed and builded on) that of two bodies of equal weight of the ſame wood, of the ſame ſhape, as to that part, which did as it were cleave the water (which was conical, being a cone, whoſe baſis was three inches diameter, and whoſe altitude was two) that body did deſcend the faſteſt through the water, which had the upper end flat, and that body the ſloweſt, which had the hindmoſt end ſharp. So that it ſeems, that that edge, which comes behind a ſquare or flat ſterned veſſel, and is called the dead water, and which is much greater in ſuch an one, than in a tapering ſterned veſſel, and is therefore commonly ſuppoſed to hinder and obſtruct the ſwiftneſs of the veſſel ſo much the more, does rather very much promote or accelerate its motion. The figures of the bodies were theſe in the margin, expreſſed by *A* and *B*, *A* repreſenting the body, that went the faſteſt; and this did not ſeem to proceed from any other cauſe than the flatneſs of the upper ſide of *A*, and the ſharpneſs of that of *B*; the weight *C*, that ſunk both the one and the other, being one and the ſame. We did yeſterday likewiſe make a conſiderable experiment of refraction in the refracting engine (which I ſuppoſe you might ſee before you went for *Oxford*) for firſt we found the refraction of water (being able to meaſure it with accurateneſs to minutes) to be very near what has been hitherto aſſigned it, namely, we found the angle of incidence to be 41°. 35′. and the angle the refracted ray made with the perpendicular to be 30°. 00′. the ſigns of which angles (being 66371 and 50000, that is, as 398+ to 300) are almoſt as 4 to 3. But all things remaining as they were, only removing the water out of the veſſel, and putting in, inſtead of it, ſpirit of wine highly rectified (which we found would burn all away, and was by weight in proportion to the water near as 19 to 22) we found, that the refracted angle remaining the ſame of 30°. 00′. the angle of incidence was 42°. 45′. whoſe ſines being 50000 and 67880, the proportion is ſomewhat more than 3 to 4, namely, are 300 to 407; ſo that it ſeems the refraction of ſpirit of wine is greater than that of water. This experiment we tried upon Mr. *Oldenburg*'s being informed, that an experiment ſomewhat of this kind had been made at *Paris*. Both theſe experiments of the deſcent of bodies through the water, and of the various refractions of ſeveral ſorts of liquors, I ſuppoſe we ſhall ſhortly proſecute more fully; there being many uſeful things on the true theory both of the one and the other. I am now engaged in a very great deſign, which I fear I ſhall find a very hard, difficult, and tedious taſk, and that is, the compiling a hiſtory of trades and manufactures; the perſon I formerly told you of, namely, Sir *John Cutler*, having very nobly and freely, without any compulſion or excitement, not only kept his word, but been better than it, ſending me in yeſterday a half year's ſalary before hand, as an earneſt of his intention. The moſt I think I ſhall be able to do in this buſineſs this term (being engaged to read for doctor *Pope*) will be only to make a ſhort ſpeech, both in praiſe of Sir *John*, my noble patron, and of the excellency and uſefulneſs of the deſign it ſelf, and of what method and courſe I ſhall take in it; and, by God's aſſiſtance, I ſhall endeavour to the utmoſt of my power, to go as far in it as I am able, being reſolved wholly to apply my mind and endeavours to it. And if I can therein any way ſerve you, as I have great hopes I

may, it will be eſteemed a very great happineſs by,

Moſt honoured Sir,
your moſt faithful
and moſt humble ſervant,
Ro. HOOKE.

Greſham College, Oct. 21, 1664.

Moſt honoured Sir,

I AM extremely ſorry, that I have not been able ſooner to ſend down the ball and ſocket you deſired; for ſuch have been the diſappointments of thoſe I had beſpoke it of, that no leſs than three have failed me, and I was fain to ſtand by a fellow moſt part of this day to direct him, and he has not yet quite finiſhed it; but I hope to ſend it down to morrow morning, for Mr. *Reeves* (who underſtands theſe things, and I think he only, of all the turners I have met with) is at preſent in ſuch a condition, that he can do nothing. Perhaps you may have heard of it: if not, in ſhort, he has, between chance and anger, killed his wife, who died of a wound ſhe received by a knife flung out of his hand, on Saturday laſt. The jury found it manſlaughter, and he and all his goods are ſeized on; and it is thought it may go hard with him. As for the time of the conjunction of Mercury and Sol, there are ſo various calculations of it, according as they are made from theſe or other tables, that it is certainly the moſt ſafe way to watch for it two or three days before, and two or three days after the 25th of October. If it appear not ſooner, we do here intend, God willing, to watch and make as diligent and accurate obſervations, as the ſeaſon (which I am apt to think will be fair) and the apparatus we have will afford; whereof, God willing, I ſhall give you a more full account in my next. Here have not been many experiments ſince the laſt time I wrote worthy your notice: only we did yeſterday try the deſcent of bodies through water; the manner of which trials, though we have not yet brought them to any accurateneſs or method, may perhaps be not unacceptable to you. We took then a good large, round, thick glaſs, and by putting in very ſmall ſhot, we brought it to an equilibrium with the water, in which we immerſed it; and then taking the exact weight of it, we had thereby the weight of as much water as was equal to it in bulk. Of this weight we weighed five ſeveral parcels of ſhot, and four other parcels, that were equal each of them to a quarter only of this weight; then putting in one of theſe quarters, we found this bottle (which was hereby a quarter heavier than water) to deſcend eight foot of water in about 4″. 45‴. putting in a ſecond, and ſo making it half heavier than water, it deſcendeth the ſame depth in 3″. 14‴. putting in a third, which made it ¾ heavier, its deſcent was in 2″. 45‴. by a fourth made as heavy again, or twice the weight of water, it deſcended in 2″. 14‴. by a whole parcel added, made thrice as heavy as water, it deſcended in 1″. 41‴. made four times as heavy, in 1″. 17‴. five times as heavy, in 1″. 10‴. five times and a half as heavy, which filled the glaſs with ſhot, in 1″. 6‴. I have not yet had time to caſt up and ſee, what proportions theſe times keep to the preponderation of the deſcending globular glaſs; nor ſhall I trouble you with the repeating of theſe trials, which were found by the inſtrument for falling bodies not to differ more than ſome few thirds one from another. But by this way, when proſecuted, I hope we may be able to raiſe a true theory of the reſiſtance of a fluid medium; but I have not as yet any time to ſpend on theſe things, and therefore ſhould be very glad, if yourſelf, or Dr. *Wallis*, or Dr. *Wren*, would examine what might be done in that kind; and what obſervations ſhall be further made, I ſhall moſt faithfully give an account of. I am ſpeedily going to make obſervations and tables of refraction by the inſtrument, which I find exceeding exact. And monſieur *Zulichem*'s account, which he ſends to Sir *R. M.* of their being able to ſee the ſatellites of Jupiter paſs between that body and our eye, and to ſee the ſhadow thoſe little moons make on the body of that earth; and to ſee thoſe ſix ſeveral belts, and ſeveral other things, whereof I am apt to think Sir *R.* himſelf may have acquainted you with, has at length made me ſet upon my way of making object glaſſes, which, you may remember, I did long ſince acquaint you with; for, certainly, if theſe be made with a mandrel only, without any tool, as the letter affirms, I hope I have reaſon to expect greater events from this, which muſt certainly be the moſt accurate way imaginable for making ſpherical glaſſes. What my ſucceſs therein ſhall be, I ſhall be ſure to acquaint you with. As concerning the baroſcope; I find, that upon the fourth inſtant it was very low, and the wind was exceeding high; many of which inſtances I have not yet obſerved; but as ſoon as I can get a little time to make me a weather clock, and to ſet all my things in order for the enquiring into the cauſes of the changes of weather, which I fear will not be till after this term, I hope I ſhall be able to give you a better account. I meet with nothing now in *Paul*'s Church-yard, but two pamphlets, which, whether worth your ſight, or not, I had not time enough to examine. I had herewithal encloſed alſo a ſmall microſcope, made with one ſingle glaſs, which I find to magnify the object, and make it as clear, when conveniently placed, as one of Mr. *Reeve*'s largeſt; but the glaſs was ſo ſmall, that, in putting up, it was rubbed off and loſt: but by the next I hope you may have as good a one ſent you by,

Moſt honoured Sir,
your moſt affectionate
and moſt faithful
humble ſervant,
R. HOOKE.

Moſt

Moſt Honoured Sir,

THERE has very little happened ſince you left *London*, that I have met with worthy your knowledge. I did (as I remember) acquaint you with the ſucceſs of the powder encloſed in an iron, which neither broke the caſe, nor was perceived to go off. Upon opening this laſt Wedneſday, there was found a pretty quantity of a black dirt, which laid on paper preſently diſſolved like an alcali: ſome of it put on a coal did not at all burn like ſalt-petre, ſulphur, or gunpowder. The ſame experiment will be tried again with double the quantityof powder, which will be a noble experiment, if it break not the veſſel, nor force itſelf away between the plug and the hole; which laſt I gueſs will be almoſt as difficult as the former; for the plug is made of ſteel, and by ſcrewing makes its own way in, and beſides the heat will make them, if poſſible, ſit cloſer together. And indeed upon viewing the laſt, I could find no ſign, by which I could gueſs it to have leaked, unleſs the alcaliſate nature of the included ſubſtance be one, of which I can ſay nothing. Some experiments we made of breaking wood, which were conſiderable, and gave occaſion to hope, that this ſubject will afford many uſeful experiments. We had a relation of a way of diſcovering the ſholes of fiſh from the top of certain hills in *Cornwall* and in *Ireland*, which was ſeconded by many teſtimonies, and is indeed a very philoſophical one, and may afford good hints. The ſtory in ſhort was this. That in thoſe parts it is uſual for a man ſtanding on the top of ſome hill near the ſea, to diſcover, where the fiſh lye in the ſea, and which way they move, and from thence by certain ſigns with his feet, and hands, and hat, to direct the fiſhermen on the water, who can perceive nothing of what he on the mountains ſees, though they be juſt over the ſhole of fiſh. Some obſervations, ſomewhat like this, I remember I have often taken notice of, from the tops of hills near the ſea ſide, whence I could perceive plainly, how far the rock ran out into the ſea, though they were covered with water to a great depth, which I could not at all ſee, when I was on the water in a boat, which made me think (and this of the Corniſh men has confirmed me) that all the appearances in theſe parts of the moon, which are accounted the ſea of it, may this way be ſolved. And this minds me to acquaint you with an obſervation I made ſeveral nights this laſt week with a teleſcope not above eight inches long, wherewith I could plainly ſee the ſatellites of Jupiter and Saturn oval, though not angulated, and the body of Jupiter appeared full as big as with a four foot glaſs; which ſhews what one might expect, if we could make object glaſſes, that would bear a large aperture and a deep charge. We ſhall to morrow make a good experiment of the velocity in the vibrations of a ſounding ſtring, of which I ſhall acquaint you by the next. There is a gentleman here in town, that has a better way of teaching muſick than what *Kircher* cauſeleſly enough vaunted his *Ars Combinatoria* to be, whereby he has preſently taught the duke of *Buckingham* to compoſe very well, though he knows nothing of the practick part of muſick. For buſineſs; here has been lately the queen's receiver to demand rent for *Stalbrige*, and has deſired to have an anſwer ſent him as ſoon as I could. Mr. *Longe* has been here likewiſe to deſire ſome ſpirit of harts-horn and ens Veneris for Dr. *Clodius*, becauſe he cannot get any of Mr. *Pullein*, and the doctor has not as yet, it ſeems, any conveniency of making it himſelf. Here was yeſterday Dr. *Willoughby* of *Merton* college in *Oxford*, to have waited on you, and deſires to have his humble ſervice preſented to you. As for my own buſineſs, wherewith I acquainted you before your departure, I cannot get any ſettlement of it, and know not as yet what it may prove, but I fear it is very dubious. Nor is there any thing done in the other buſineſs, the one, I think, hindring the other. The condenſing engine and the ſcales I have now by me, but did not ſend them, becauſe I hope my lord *Orrery*'s ſafe arrival will haſten your return to town. The pipes likewiſe are ready; and if there be any thing elſe you deſire to be provided againſt your coming, they ſhall, upon the receiving of your commands, be ſpeedily provided by,

Moſt Honoured Sir,

your moſt faithful, and

moſt obliged humble ſervant,

ROB. HOOKE.

MR. *Oldenburg* deſires to have his ſervice preſented to you.

[Oct. 29, 1664.]

Moſt honoured Sir,

I WAS not a little troubled, when upon Friday noon calling at the *Saracen's Head*, to ſee whether the ball and ſocket were gone (as the porter, that belongs to *Moore*, had with all aſſeverations promiſed it ſhould be by that morning's coach, for it was delivered to him before nine of the clock that morning) I found, that he had played the rogue, and kept it behind, intending to ſend it, as I ſuppoſe, by the next week's waggon, and this, though it were delivered to him with as great a charge as could be imagined. But as it has ſince fallen out, I hope there was not much harm done, Mercury having been too ſubtil for thoſe, that laid ſpies for him, by ſlipping by the ſun either in the night, or at leaſt by one ſide of the diſk of the ſun; for to none of thoſe, that endeavoured to find this conjunction here at *London*, has there been any glimpſe of it, though upon Tueſday, as I imagined we ſhould, we had very fair and clear weather. All which day my lord *Br.* Sir *W. P.* Mr. *Ball*, and myſelf, were very diligent in obſervations. I did not neither omit to obſerve the ſun on Monday and Wedneſday, as oft as I had opportunity

portunity of ſeeing it appear from between the clouds. Upon Wedneſday laſt we had ſcarce any thing done, the moſt of the Society being gone to *Woolwich*, together with the king and council, and moſt part of the court, to ſee the great ſhip launched. I did notwithſtanding diſſect a viper, which gave ſome good diſcourſes of poiſon, among the reſt Dr. *Croone* gave an account, that he had newly ſpoke with a perſon, that had a long time lived in the court of the king of *Macaſſer*, and had ſeen hundreds diſpatched with thoſe ſtrange kind of poiſons: and though very many European chirurgeons had tried to recover the perſons, only very ſlightly hurt by the poiſoned weapon, and though they had immediately, as ſoon as ever the perſon were hurt, cut out all the wounded part; yet within a very ſhort ſpace thoſe poor wretches would fall down ſtone dead. But as concerning the fleſhes being turned into a gelly, he could never have any certain knowledge of it, having never himſelf ſeen any ſuch effect. Mr. *Povey* affirmed further of our Engliſh vipers, that though many had thought the biting no way mortal, yet that not long ſince a gentleman, with whom he was intimately acquainted, was, by a bite in his hand from a provoked Engliſh viper, though all endeavours had been immediately uſed to prevent any ill ſymptoms, at length killed, after he had ſuffered an exceeding chillineſs and deadneſs in that hand and arm for about a twelvemonth, ſo as that he could not keep any heat in them, though wrapped with all imaginable care in furs and other warm clothes. Now though I was able to obſerve little in that day, yet I have ſince by examining the carcaſe found, that the teeth (though at firſt they appeared perfectly tranſparent, and ſeemingly ſolid) were all hollow, and filled with a liquor, or juice, which it is not unlikely may be their poiſon; for upon the drying of the teeth, I found, that that juice was alſo waſted, and by a chain of ſmall bubbles, which then was viſible enough through the microſcope. I perceived the air had found the way into the cavity of the teeth. I fancied this viper had two fangs growing directly under each eye: that of them, which was under the right eye, though to the naked eye it appeared only one was diſcovered by the microſcope, to conſiſt of two ſmall teeth much like cat's claws, that on the left ſide was only one ſingle one. The contrivance for erecting and retracting, or ſheathing the teeth, was very pretty, and like all other articular motions of the body very mechanical; for by their opening their mouths, two ſmall jaw bones (as I may call them) which lay in the roof or upper part of their mouth, were made to thruſt outwards and forwards, and thereby being joined as it were to the midſt of the fangs; they erected the fangs, and there made them unſheath or appear without a kind of lid or præputium, into which they did again ſlide and lye concealed, when thoſe bones were drawn backward and inwards. Theſe ſmall bones had each of them ſeven or eight ſmall teeth apiece: the viper had alſo two ſuch ſmall bones in the under-chop. Exactly like theſe Dr. affirms, the teeth of a rattle ſnake to be, but exceedingly bigger; and the hole in thoſe teeth to be big enough to have a pin thruſt into it. I did alſo make ſeveral tables of refractions from experiment, and find the hypotheſis of ſines to hold ſo great exactneſs, ſo that I think we need not much doubt, but that could we make elliptical glaſſes, much might be done in microſcopes more than has been yet performed. I tried the refraction alſo of a very ſtrong ſolution of common ſalt in water, and found the refraction greater than in common water. But which is more ſtrange than any yet made, I found very clear oil of turpentine to have the greateſt refraction of any body I have yet tried, though it be in ſpecie much lighter than the ſpirit of wine or any body I know. What my calculations are, I have here tranſmitted in the following tables. I have alſo in the encloſed box put up one of the ſeeds of muſk graſs, which is the only one I have left, having given but one of the bills this year: this you will find under the ſmall microſcope. The glaſs of this microſcope, though very ſmall, is, I think, very good, which you may perceive, if, without ſtirring the ſmall bruſh of hairs I have ſtuck on to it, you view them againſt the light of a candle, or of the window. I am now very buſy about an engine for making long teleſcopes, and almoſt finiſhed it; and hope by the next to have ſo far proceeded and ſucceeded in it, as that you may receive an account of it, which I hope will not be unacceptable to you, from,

Honoured Sir,
your moſt affectionate,
moſt faithful, and moſt
humble ſervant,
Ro. HOOKE.

Common water.

The obſerved angle in the liquor.	The obſerved angle in the air.	The ſine of the obſerved angle in the liquor.	The ſine of the obſerved angle in the air.	The hypothetical proportion of the ſines of the angles of inclination in the air.	The angle anſwering the hypothetical ſine.
5.	6.39	8716	11407	11609	6.40
10.	13.19	17365	23033	23352	13.30
15.	20. 5	25882	34339	34474	20.10
20.	27. 4	34202	45503	45557	27. 6
25.	34.15	42262	56280	56294	34.15+
30.	41.45	50000	66588	66666	41.46−
35.	50.00	57358	76604	76400	49.50
40.	58.45	64279	85491	85419	58.40
45.	70.30	70711	94264	94387	70.42

Brine.

10.	13.35	17365	23486	23759	13.44+
20.	27.43	34202	46510	46756	27.52+
30.	43.10	50000	68412	68412	43.10

Oil of turpentine.

10.	14.45	17365	25460	25900	15.00+
20.	30. 5	34202	50126	50298	30.11+
30.	47.20	50000	73531	73531	47.20

Greſham College, Nov. 10, 1664.

Moſt honoured Sir,

I HOPE you received the ball and ſocket, together with two little pamphlets, and the beard of a muſk graſs ſeed, which I ſince incloſed in a ſcribble. I have not ſince that met with any thing worthy your knowledge; only this week I made two experiments, which perhaps may not be unacceptable; the one was of refraction, wherein, in proſecution of the former experiments, I made ſome further trials upon ſallet oil, and found the refraction of it to be much greater than that of any liquor I have yet tried; the refraction of thirty grains requiring no leſs than an angle of inclination in the air of 46°. 30′. and of twenty, an angle of inclination of 29°. 47′. So that the proportion of their ſines is very near as 20 to 29½. or almoſt as 2 to 3. Theſe experiments I am further proſecuting, to find out the refraction of all kinds of ſaline menſtruums, of hot and cold water, of ſeveral kinds of oils; after that, I intend another inſtrument to find all the various refractions of cryſtal, glaſs, ice, horn, gums, and other tranſparent ſolid bodies; the refractions alſo of the parts of the eye, *&c.* Of each of which, as faſt as I make them, I ſhall ſend you an account. The other experiment (which I ſhall hardly, I confeſs, make again, becauſe it was cruel) was with a dog, which, by means of a pair of bellows, wherewith I filled his lungs, and ſuffered them to empty again, I was able to preſerve alive as long as I could deſire, after I had wholly opened the thorax, and cut off all the ribs, and opened the belly. Nay, I kept him alive above an hour after I had cut off the pericardium and the mediaſtinum, and had handled and turned his lungs and heart and all the other parts of its body, as I pleaſed. My deſign was to make ſome enquiries into the nature of reſpiration. But though I made ſome conſiderable diſcovery of the neceſſity of freſh air, and the motion of the lungs for the continuance of the animal life, yet I could not make the leaſt diſcovery in this of what I longed for, which was, to ſee, if I could by any means diſcover a paſſage of the air out of the lungs into either the veſſels or the heart; and I ſhall hardly be induced to make any further trials of this kind, becauſe of the torture of the creature: but certainly the enquiry would be very noble, if we could any way find a way ſo to ſtupify the creature, as that it might not be ſenſible, which I fear there is hardly any opiate will perform. I obſerved this, that at any time, if the bellows were ſuffered to reſt, and that by that means the reciprocal motion of the lungs were not continued, the animal would preſently begin to die, the lungs falling flaccid, and the convulſive motions immediately ſeizing the heart and all the other parts of its body; but upon the renewing the reciprocal motions of the lungs, the heart would beat again as regularly as before, and the convulſive motions of the limbs would ceaſe. There are ſeveral, that are much awakened by this experiment, and, I find, intend to proſecute it much further; of which I hope I ſhall have a certain account. There was the laſt day of meeting, Nov. 2. a letter from monſieur *Zulichem*, wherein mention was made of a weaker glaſs made by the means of the riſing and falling of a ball of wax in ſalt water. This I had then acquainted you with, but that I knew it would be no news, ſince I well remember, there were ſeveral experiments of this kind proſecuted by you at *Chelſea* three or four years ſince. There has nothing elſe occurred worthy your knowledge; which if there had, or that for the future any ſuch ſhall, you ſhall thereof receive a punctual account from,

Moſt honoured Sir,

your moſt humble and

moſt faithful ſervant,

R. HOOKE.

I HAVE not yet made any trial of my new engine, though it be now up, and was yeſterday examined by my lord *Br.* Sir *R. M.* Sir *Paul N.* and ſeveral others, and not one objection made againſt it, but approved by all. I hope within ſome few days to make ſome trial, how it will anſwer expectation. I forgot to acquaint you in my laſt, that it was Mr. *Richard Reeves*, that has killed his wife, but he now hopes, that he ſhall be able to get off, only it will coſt him ſome money. The bookſeller's ſhops afford nothing new.

November 24, 1664.

Moſt honoured Sir,

HAVING received the honour of your commands by Dr. *Wren*, for procuring an inſtrument for refraction, whereby, as he told me, you deſigned to try the refraction of the humours of the eye; I did that very afternoon beſpeak it; and I hope within a few days it will be ready to be conveyed to you. I have likewiſe procured out of Mr. *Oldenburg*'s hands ſome of the firſt ſheets; and ſhall delineate as many of the inſtruments you mention, as I ſhall find convenient, or (if it be not too great a trouble to you) as you ſhall pleaſe to direct. I think it will be requiſite alſo, becauſe your deſcriptions will not refer to the particular figures and parts of them by the help of letters; that therefore it would not be amiſs, if I add two or three words of explication of each figure, much after the ſame manner, as the affections of the priſm are noted in your book of Colours. The figures I think need not be large, and therefore it will be beſt to put them all into one copper plate; and ſo to print them, that they may be folded into, or diſplayed out of the book, as occaſion ſerves. This puts me in mind to acquaint

you alſo, that Mr. *Faithorne* has now at laſt promiſed me with all the aſſeverations imaginable, that he will not fail to finiſh your picture by the middle of the next week at furtheſt, and therefore I think I ſhall employ Mr. *Loggan* (who is an excellent graver alſo) that I may not take Mr. *Faithorne* off from finiſhing that plate. As for the microſcopical obſervations, they have been printed off above this month; and the ſtay, that has retarded the publiſhing of them, has been the examination of them by ſeveral of the members of the Society; and the preface, which will be large, and has been ſtayed very long in the hands of ſome, who were to read it. I am very much troubled there is ſo great an expectation raiſed of that pamphlet, being very conſcious, that there is nothing in it, that can anſwer that expectation; but ſuch as it is, I hope I ſhall prevail with the printer to diſpatch ſome time this or the next week. I have not yet brought the new way of grinding glaſſes to ſuch perfection, as may deſerve your knowledge, though I have not been wanting in endeavouring to go through with that buſineſs. And though I meet with many rubs, which bare ſpeculation could not ſo eaſily inform me of, yet obſerving, that to be a fortune, which is almoſt inſeparable from all attempts of any new thing, and out of the common road, I ſhall not at all ſlacken my diligence in proſecuting of it. The perſon you were pleaſed to mention, as having made the anatomical experiment on the heart of a dog, was at the Society the next day, and made a ſhort report of it. I have been able to try very little in anatomy ſince my laſt; only I opened a viper, and found, that all the lungs were nothing but one continued bladder, which reached more than half the length of the body; that the upper part only of it was interwoven with an infinite company of veins and arteries; and that near thoſe veſſels I could diſcover ſeveral ſmall veſſels, which ſeemed filled with ſeveral chains of ſmall bubbles. I have not yet been able experimentally to determine, what the uſe of them may be: whether they were to be conjoined with the blood in the veſſels, or with the open air, I cannot yet determine. I hear of nothing new in *Paul*'s Church-yard, but only *Ricciolo*'s ſecond part of his Almageſtum is publiſhed and expected daily. There has nothing elſe occurred worthy your knowledge, which, as often as there does, an account thereof ſhall be ſpeedily preſented you by,

Moſt honoured Sir,

your moſt humble and

moſt faithful ſervant,

R. HOOKE.

THIS incloſed I received from Mr. *Evelyn*, who deſires his moſt humble ſervice to be preſented to you.

Dec. 13, 1664.

Moſt honoured Sir,

I AM not only aſhamed, that I have not ſooner given you an account of what I promiſed in my laſt, but much more, that I am able as yet to ſay ſo little to the purpoſe; for though, when I laſt writ, I was promiſed, both by Mr. *Faithorne* and Mr. *Thompſon*, that I ſhould have thoſe things which they had in their hands, finiſhed within three or four days; and though I have often called upon them, and urged them all I could, I have not been able to get them done. I have lately obſerved many circumſtances in the height of the mercurial cylinder, which do very much croſs my former obſervations; for at this very time the quickſilver is as high as I have a long time obſerved it, and I don't remember, that it has been higher: it has riſen a little for theſe four or five days, and has continued ſo, notwithſtanding the variety of winds, and the multitude of rain, that has lately fallen; and, I think, it riſes a little yet, but it is but little. I have taken notice alſo of two or three other very odd particulars lately in it, which have croſſed ſeveral other obſervations. The experiments we are now moſt buſy about, are concerning the adjuſtening of the length of pendulums, thereby to ſettle a common ſtandard for length; of which kind, Mr. *Zulichem* has ſent over ſome very pretty theories; but upon very careful trial with ſeveral accurate and large pendulums, made with balls of lignum vitæ, ſome of which balls are ſix inches over, others no bigger than the head of a pin, or a ſmall ſhot, and ſuſpended by a very curious hair, which ſeems as likely a way as any to find out to what point of the globular body, hung at the end of a ſtring, the length of ſuch a pendulum is to be reckoned. Monſieur *Zulichem* ſays, it is $\frac{2}{5}$ parts of a third proportional below the center of the ball c, the firſt of which proportionals are, $ab+bc$ (that is, ac) and bc; namely, $ab+bc$, $bc :: bc; \frac{bc\,bc}{ab+bc}$, which we will ſuppoſe ce; $\frac{2}{5}$ of which taken below the centre gives d the point, to which the length of the pendulum ad is to be meaſured from a, the point of ſuſpenſion. Sure it is, that this point is below c, the center of the body; but whether at d, I cannot poſitively yet affirm. The plate for your book was graven before I received your laſt of Mr. *Evelyn*'s. I have only taken notice of ſeven inſtruments, which you in thoſe ſheets I looked on have deſcribed; and thoſe I ſo put into one ſmall plate, that they will fold out of the book, when there is occaſion. This laſt of Mr. *Evelyn* I have given a ſmall draught of alſo to the engraver, who is not an Engliſhman, but one, that I find a very good workman, and very punctual to his word; which was the reaſon I did not employ Mr. *Faithorne*, as you directed, he having ſo very often and often diſappointed my expectation. I have ſince my laſt made an anatomy of a dog, and hope, that I have

made

made a conſiderable new diſcovery; but this being the firſt time I have ſeen it, at leaſt taken notice of it, I cannot, till further trial, poſitively affirm any thing, which, as ſoon as ever I am aſſured of it, you ſhall thereof receive an account from,

SIR,

your moſt faithful, and

moſt humble ſervant,

R. HOOKE.

I HOPE, Sir, you will pardon this haſty ſcribble, for it was very near eleven a clock this night, before I could get from ſome company, met about the buſineſs of Sir *J. Cutler*.

Dec. 15, 1664.

Moſt honoured Sir,

THIS letter coming ſo late to the poſt-houſe on Tueſday night, was brought back to me, ſince which I have made farther trial of Mr. *Zulichem*'s experiment; and both my lord *Br.* Sir *R. M.* and Dr. *Wren*, were judges and examiners of the experiment, and find, that the trials made with theſe pendulums, whoſe balls were of lignum vitæ, did not anſwer to Mr. *Zulichem*'s rule, and therefore it is now much doubted of. We had yeſterday in ſeveral parts of *England*, an account of the appearance of a very great comet in the ſouth ſouth-eaſt, with a very long tail, extended towards the north-weſt; ſome ſay about ten yards long, ſome about two; but how much that is, is difficult to gueſs, unleſs we could ſee it, which I have done all this laſt night, but to little purpoſe, by reaſon of the thickneſs of the air. It has been ſeen in *Yorkſhire*, and in *Cheſhire*, and at *Portſmouth*, and ſeveral other parts of *England*. I this day got a ſight of Mr. *Faithorne*'s plate, and indeed he has done the face very carefully and well; and, I think, very like; but has not quite finiſhed the plate. The other cuts are finiſhed for your book of Cold; but Mr. *Thompſon* has again diſappointed me. Your anatomical experiments, read by Mr. *Oldenburg*, were very highly approved of by the whole Society. I cannot yet perfect my teleſcope glaſſes, though they do now very much more flatter me with hopes than at firſt; ſo that I ſhall not yet give over. It ſeems, by ſome papers of Mr. *Oldenburg*, that they have made in *France* object glaſſes of 250 palms, which is about 160 feet long, and make uſe of them without a tube.

Greſham-College, July 8, 1665.

Moſt Honoured Sir,

I DID this laſt week ſend down by *Moor*'s waggon a weather-glaſs poiſed upon its centers. I ſuppoſed it would be very eaſy to get a frame made for it at *Oxford*, otherwiſe I would have ſent one with it, but it would have much endangered the breaking of the thermometer, which it did once in our packing of it up; but I cauſed another to be made, which I think is very ſtrong, and, I hope, very ſafely packed up. I doubt not, but that you have long before this heard of the adjourning of the Royal Society, and of the increaſe of the ſickneſs, which rages much about that end of the town you left. I hear, ſeveral in the *Pell-mall* are infected, and one houſe almoſt emptied. It is not much ſpread as yet in the city, God be praiſed, though it be dangerouſly ſcattered. I cannot, from any information I can learn of it, judge what its cauſe ſhould be, but it ſeems to proceed only from infection or contagion, and that not catched but by ſome near approach to ſome infected perſon, or ſtuff: nor can I at all imagine it to be in the air, though yet there is one thing, which is very differing from what is uſual in other hot ſummers, and that is a very great ſcarcity of flies and inſects. I know not whether it be univerſal, but it is here at *London* moſt manifeſt. I can hardly imagine, that there is a tenth part of what I have ſeen other years. We have made very few experiments ſince you were pleaſed to be preſent, but I hope, as ſoon as we can get all our implements to *Nonſuch*, whither Dr. *Wilkins*, Sir *W. Petty*, and I, are to remove next week, I ſhall be able to give you an account of ſome conſiderable ones, we having deſigned to proſecute the buſineſs of motion through all kinds of mediums, of which kind Sir *W.* has made already many very good obſervations. We ſhall alſo take the operator along with us, ſo that I hope, we ſhall be able to proſecute experiments there as well almoſt as at *London*; and if there be any thing, that you ſhall deſire to be tried concerning the reſiſtance of fluid mediums, or any kind of experiments about weight or vegetation, or fire, or any other experiments, that we can meet with conveniencies for trial of them there; if you would be pleaſed to ſend a catalogue of them, I ſhall endeavour to ſee them very punctually done, and to give you a faithful account of them. I very much fear alſo, that we ſhall be forced againſt our wills to ſtay there long enough to try experiments of Cold, though I have ſome thoughts of removing to another place farther from *London*, where I have deſigned to try a large catalogue of experiments, ſuch as one cannot every where meet with an opportunity of doing; but the country people are now ſo exceeding timorous, that they will not admit any, unleſs one have been a conſiderable time abſent from *London*. I was this day informed by one, that received a letter thence, that the plague rages ſo extremely in *Southampton*, that ſometimes there die thirty in a night; and that has made *Portſmouth*, and the iſle of *Wight* ſo fearful, that they will ſuffer none to enter. The founder has brought home the ſaucer ſtop-cock, which I ſent about the caſe of the weather-glaſs. Mr. *Thompſon* alſo has ſent home the inſtrument for taking angles, and demands two and thirty ſhillings. It is not quite finiſhed, but I intend to take it with

with me to *Nonſuch*, and there to make trial of it, and adjuſten it. I ſhewed it the laſt meeting of the Society, which it was very much approved of; and I hope it will be the moſt exact inſtrument, that has been yet made. But I weary you with my impertinencies, and muſt therefore humbly beg your pardon, and make haſte to ſubſcribe myſelf,

Moſt honoured Sir,

your moſt humble, and

moſt faithful ſervant,

R. HOOKE.

Aug. 15, 1665.

Moſt honoured Sir,

I HAVE not ſince the receiving of your letter, had the opportunity of ſending to Mr. *Oldenburg*, to learn from him the account of the experiment, which you were pleaſed to mention in it. I have longed very much to be ſatisfied concerning it, as believing it very conſiderable. I have made trial ſince I came hither, by weighing in the manner, as Dr. *Power* pretends to have done, a braſs weight both at the top, and let down to the bottom of a well about eighty foot deep, but contrary to what the doctor affirms. I find not the leaſt part of a grain difference in a weight of half a pound between the top and bottom. And I deſire to try that and ſeveral other experiments in a well of threeſcore fathom deep, without any water in it, which is very hard by us. One of our quadrants does to admiration for taking angles, ſo that thereby we are able from hence to tell the true diſtance between *Paul*'s and any other church or ſteeple in the city, that is here viſible, within the quantity of twelve foot, which is more than is poſſible to be done by the moſt accurate inſtrument, or the moſt exact way of meaſuring diſtances. The other, which is yours, I hope within a day or two to perfect it, ſo as to go much beyond the other for exactneſs, of which I may give you an account as ſoon as I have tried. There happened lately a pretty odd accident: A very young and ſeemingly healthy gentlewoman by drinking the *Epſom* waters, and afterwards giving her young child (not yet much above a quarter old) ſuck, found, to her extreme ſorrow, that though the waters did not at all work with her, yet that ſo wrought on the ſucking child, that it fell into a moſt violent looſeneſs and griping, which within three days killed it. I made laſt night alſo a pretty odd diſcovery of a new kind of ſhining animals, whoſe blood, or juices, did ſhine more bright than the tail of a glow-worm, when the candle was put out. I have nothing more to add, but that I am,

Moſt honoured Sir,

your moſt faithful, and

moſt humble ſervant,

R. HOOKE.

THERE is ſomewhat above thirty ſhillings due to Mr. *Thompſon*. I have forgot the particular ſum, but if I miſremember not, it was thirty two ſhillings: but as for Mr. *Faithorne*, I never made any bargain for more than twelve pound, nor did he at firſt mention any more of me. If you have any further commands, you may ſend it thither by the poſt, I ſuppoſe, if not to be left for me at *Greſham* college, from whence I receive letters uſually once a week. I am ſtill at *Durdens*, my lord *Berkley*'s houſe near *Epſom*, where Dr. *W.* only remains, Sir *W. P.* being gone to *Saliſbury*. My ſervice, I beſeech you, Sir, to Mr. *Croſſe* and his lady, and to Dr. *Lower*, if in *Oxford*.

Durdens, Sept. 26, 1665.

Moſt honoured Sir,

I WAS a little troubled at the miſcarriage of my laſt letter, and ſo much the more, becauſe I could not till now find an opportunity of repeating my requeſt I therein made. I did therein, as I remember, ſend an account of ſome trials I had then newly made in a well not far from us, which, upon meaſuring, I found to be no leſs than three hundred and fifteen foot in its perpendicular depth, though that was ſhort alſo of the depth, that I was aſſured it was of, before it had been filled up by timber, ſtones, and other rubbiſh; for the owner of it affirmed it to be no leſs than ſeventy fathoms deep by meaſure, or four hundred and twenty foot, ſo that it ſeems no leſs than a hundred foot is filled with rubbiſh, at leaſt it is ſtopped by ſome croſs timber, which I rather ſuſpect, becauſe that I found the weights to be ſtayed by them, if I ſuffered them to deſcend below that depth. One of the experiments I tried in it was that of gravity, which upon accurate trial I found to ſucceed altogether as the former, whereof I gave you an account before. I tried alſo an experiment in it with four large candles, lighted and placed at a convenient diſtance, one from another, in ſockets faſtened on a board for that purpoſe. The iſſue was, that they burnt very freely, and blazed, till they had deſcended about two hundred and forty foot from the top, where they ſuddenly began to grow dim, and quickly after went out all together, as if ſuddenly quenched or extinguiſhed by their ſinking into a damp; which if ſo, the damp muſt be no leſs than threeſcore foot deep. I was not then able to repeat the experiment, by reaſon of the loſs of thoſe candles by an unlucky accident before I had got up the line.; nor have not ſince had time, but I propoſe, God willing, ſhortly the further proſecution of it, together with a long ſeries of experiments, which I have thought on, it being ſuch an opportunity, as is ſcarce to be met with in any other place I know. I have in my catalogue already thought on divers experiments of heat and cold, of gravity and levity, of condenſation and rarefaction of preſ-

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ſure, of pendulous motions and motions of deſcent; of ſound, of reſpiration, of fire, and burning, of the riſing of ſmoke, of the nature and conſtitution of the damp, both as to heat and cold, drineſs and moiſture, denſity and rarity, and the like. And I doubt not but ſome few trials will ſuggeſt multitude of others, which I have not yet thought of; eſpecially if we can by any means make it ſafe for a man to be let down to the bottom. I ſhould very gladly receive from you, if it be not too great a trouble, a catalogue of ſuch experiments, as you ſhall think fit to be tried to it, which was indeed the chief buſineſs of my laſt ſcribble. I am going ſhortly for a little while into the *Iſle of Wight*, and ſo perhaps may not till my return be able to make thoſe trials; but I ſuppoſe the winter will not afford leſs inſtructive experiments than the other. And therefore what you ſhall pleaſe to ſuggeſt now will not come too late for winter experiments, eſpecially if I can give order for making ready an apparatus for them before I take my journey, which I ſhall be able to do, if by the return of this bearer you pleaſe to ſend them to,

Moſt honoured Sir,

your moſt humble, and

moſt faithful ſervant,

ROB. HOOKE.

Greſham College, February 3, 1666.

Moſt honoured Sir,

I DID by my laſt letter, which I ſent to you from *Durdens*, acquaint you with my laſt trials, which I made in the deep wells, which were indeed ſo conſiderable, that I have many times ſince wiſhed, that I could have another opportunity of examining them further. Whether that and another I ſent not long before came to your hands, I now begin to doubt, being aſſured, that many other letters, which I ſent from *Epſom* to be delivered at the poſt houſe, in that time of confuſion, miſcarried, eſpecially ſince Mr. *Oldenburg* tells me, that you have intimated to him, that it is much longer ſince you have received any from me. I am ſomewhat troubled, indeed, that my laſt did miſcarry, if it has ſo, becauſe therein I had ſet down, whilſt they were freſh in my memory, moſt of the particulars, which I thought moſt obſervable in thoſe trials. The ſum of which, if I miſremember not, was this; that the air at the bottom of the well was exceeding hot, when the air above was ſo very cold, that every thing froze immediately almoſt; ſo that, notwithſtanding the great increaſe of preſſure at that depth, yet the air in the inſtrument we let down for that purpoſe was abundantly much more rarified at the bottom, than it was before we had let it down, and after we had pulled it up. Another thing, which was not leſs obſervable, was, that all the glaſs veſſels we let down into the well were, when we pulled them up, all covered over very thick with great drops of dew or water, ſo that from one of the bottles, I believe, ſeveral ſpoonfuls might have been collected; and notwithſtanding this, the hygroſcope I let down at the ſame time manifeſted, that the air at the bottom was exceeding much drier than it was at the top; the candles, which we divers times tried, went out much about the ſame depth always; and ſometimes, by ſuddenly pulling them up about half a dozen fathom, they would rekindle, and burn afreſh. We found but little difference between the time, that wooden and leaden bullets deſcended this ſpace; nor could I ſenſibly diſtinguiſh, that there was any difference between the reſounding eccho from the bottom, and the like eccho from an horizontal wall equally diſtant upon the ground, though the return were very much ſtronger, but more confuſed by the greatneſs of the noiſe. The weather was ſo very cold, when we made theſe experiments, that made us haſten then ſo much the more; and I have not ſince had an opportunity to repeat them, though, God willing, I intend to make many other of the like kind, either there or elſewhere, ſome time this ſummer; and I have great hopes of having an opportunity of examining both greater depths and much greater heights, in ſome of our Engliſh mines, and ſome of the mountains in *Wales*, which, with ſome other good company, I deſign to viſit this next ſummer. Mr. *Tillotſon* has a very young child, which, from the ſwelling of the joints, ſome imagine to have the rickets; and, upon my naming of your ens veneris, he has much deſired me to procure him ſome of it. I would deſire therefore in your next, that you would be pleaſed to direct me, where I may meet with ſome of it, that is good and well made, that I may procure for him. I am now making a collection of natural rarities, and hope, within a ſhort time, to get as good as any have been yet made in the world, through the bounty of ſome of the noble-minded perſons of the Royal Society. I hope we ſhall have again a meeting, within this week or fortnight at fartheſt, there being now a ſufficient number of our members in town; and then I hope we ſhall proſecute experiments and obſervations much more vigorouſly; in order to which alſo I deſign, God willing, very ſpeedily to make me an operatory, which I deſign to furniſh with inſtruments and engines of all kinds, for making examinations of the nature of bodies, optical, chemical, mechanical, *&c.* and therein to proceed by ſuch a method, as may, I hope, ſave me much labour, charge, and ſtudy; and in this deſign there will be ſome two or three others, that will join with me, who, I hope, are of the ſame mind with me. But I much forget my ſelf, to trouble you, Sir, with theſe my impertinencies, before they are completed; though, when they are ſo, I muſt beg, that you will ſend a word or two of directions (concerning ſome chemical operations and methods) to,

Moſt honoured Sir,

your moſt humble ſervant,

R. HOOKE.

March 21, 1665-6.

Honoured Sir,

THIS account having had the honour to be very well approved in the Royal Society, though the experiments contained in it are no other than what I have formerly acquainted you with yet, there being ſomewhat of new hypotheſis, and giving ſome account of the apparatus which is now preparing for the trial of thoſe experiments, and ſomewhat likewiſe of the main-drift of them, I have added them to this ſcribble. Mr. *Tillotſon* returns his humble ſervice for the ens Veneris you were pleaſed to promiſe him, but I have ſince procured him ſome very good here in town, which has ſerved the turn ſo, that I ſhall give you no further trouble concerning it. I have given Mr. *Shortgrave* directions for making of a wheel baroſcope for you by a new way, which is much more facil than the former, both in making, filling, and rectifying. He ſhews me likewiſe ſome braſs pipes, which if they be for injection, or tranſfuſion of blood, they would be ſomewhat better to have ſmall protuberances left at the end, that they may not ſlip out of the veſſel, when they are tied on to it; but knowing not the deſigns of them, I could not direct him. I very much rejoice to hear of your return to theſe parts, and am glad you have made choice of this end of the town: the place I was lately to ſee, and believe it to be a very good air; it is pleaſant, private, and there is a very good neighbourhood, and it is not full three miles from hence all over pleaſant fields. I do not hear of the death of any of your workmen ſave Mr. *Thompſon*, and Mr. *Shaw* the founder; and here are others of the ſame trade good workmen. I thought to have conveyed this by Dr. *Wren*, who is this day gone for *Oxford*, but I was hindered by company this morning. He has ſomething worth your peruſal; amongſt the reſt a relation of *China*, new and very good of its kind, though it contain not much of philoſophical information till towards the latter end, much of which ſeems to be tranſcribed from others. Two or three leaves I have turned down in it on ſuch things as I met with remarkable. But I have already given you too much trouble, and therefore beg your pardon. I am,

Honoured Sir,

your moſt humble, and

moſt faithful ſervant,

R. HOOKE.

OUR collections of rarities at *Greſham* college is now very well worth your perſual, and I hope to increaſe it every day. We had yeſterday a very full meeting here of the Society, and I hope a greater the next week. I am very glad to hear, that you have a ſixty foot teleſcope; certainly it may help us to many good diſcoveries, if it be well made uſe of. I did the laſt week ſee an elliptical glaſs, which in truth did ſomething extraordinary, and more than I had ſeen before; and I expect ſhortly to ſee much better.

GRAVITY, though it ſeems to be one of the moſt active principles in the world, and conſequently ought to be the more conſiderable, has yet had the ill fate to have been alway till of late eſteemed otherwiſe, even to ſlighting and neglect. But the inquiſitiveneſs of this latter age has begun to find ſufficient arguments to entertain other thoughts of it. *Gilbert* began to imagine it a magnetical attractive principle inherent in the parts of the terreſtrial globe. The noble *Verulam* alſo in part embraced this opinion. But *Kepler* (not without good reaſon) makes it a property inherent in all celeſtial bodies, ſun, ſtars, planets: this ſuppoſition we may afterwards more particularly examine. But firſt it will be requiſite to conſider, whether this gravitating power be inherent in the parts of the earth; and if ſo, whether it be magnetical, electrical, or of ſome other nature diſtinct from either.

IF it be magnetical, any body attracted by it ought to gravitate more when nearer its ſurface, than when farther off. To examine which propriety ſeveral trials have been made both on the higher parts of *Weſtminſter* abbey, and alſo at the top of St. *Paul*'s ſteeple: but though in the making of them, I endeavoured to be as accurate as the way was capable of, I tried it by; (which way by counterpoiſing a heavy ſolid body, and as much braſs wire as would ſerve to let down that body from the top to the bottom of the building; and then poiſing thoſe equilibrated bodies, firſt whilſt the ſolid body and wire were in the ſcale at the top, and afterwards by poiſing them likewiſe when the body was let down almoſt to the bottom by the wire, whoſe upper end was faſtned to the ſcale at the top;) yet ſuch were the inconveniencies this wire was ſubject to from the vibrations of ſo long a line, and from the motion of the interpoſed air, that nothing of certainty could be collected from theſe trials, ſave only, that if there were any difference in the gravitation of the body, it was but very ſmall and inconſiderable. Since I found in the trials made from the top of the abbey, that a few grains put into this or that ſcale would manifeſtly turn the beam this or that way, notwithſtanding the former inconveniencies. But to diſtinguiſh, whether there be any the leaſt variety, muſt be attempted ſome other way, of which by and by.

NEXT, if all the parts of the terreſtrial globe be magnetical, then a body at a conſiderable depth below the ſurface of the earth ſhould loſe ſomewhat of its gravitation, or endeavour downwards by the attraction of the parts of the earth placed above it. This opinion ſome experiments made by ſome worthy perſons of this honourable Society ſeem to countenance. But conſidering the vaſt proportion of the decreaſe of gravity at ſo ſmall a depth, it ſeemed not improbable,

but

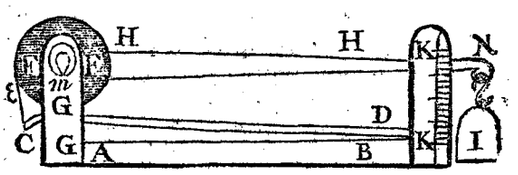
but that the motion of the air, or ſome other unheeded accident, might intervene in theſe experiments, which might much contribute thereunto. For the trial of which I had a great deſire; and happily meeting with ſome conſiderable deep wells near *Banſtead Downs* in *Surry*, I endeavoured to make them with as much exactneſs and circumſpection as I was able: my firſt trials were, a well of about fifteen fathom deep, or ninety foot; the thread I made uſe of was about fourſcore foot long. The bodies I weighed by it were braſs, wood, ſtone, each of which at ſeveral times I counterpoiſed exactly, and hung the ſcales, which were very good ones, over the midſt of the well, ſo as the packthread might hang clear down to the bottom without touching the ſides: the effects were theſe, that each of theſe bodies ſeemed to keep exactly the ſame gravity at the bottom and top. For trying it when the air was ſtill and calm, I found, that the weight of a grain would eaſily turn the ſcales either way, according as it was put into the one or the other ſcale; which exactneſs of equipollency in the ſcales I found, both before I let down the body by the thread, when they were ſo let down, and after they were again drawn up. So that it ſeemed manifeſt, that about a pound weight, either of wood, flint, or braſs, by being placed fourſcore foot either nearer or farther from the centre of the earth, did not vary its weight more than a grain, that is, not more than a 7680 part of its weight, by having fourſcore foot of earth ſituate about it, whereas the other experiments make it loſe near a ſixteenth part in depth not much greater.

THIS experiment I afterwards tried with the like circumſpection in a well of near threeſcore fathoms deep, where the weight, though ſuſpended at the end of a ſtring of about three hundred and thirty foot long, ſeemed to continue of the ſame weight, that it had above, both before it was let down, and after it was pulled up. For the beam of the balance, though very tender, did in all theſe trials keep as to ſenſe exactly its horizontal paralleliſm or equilibration; ſo that this opinion, how probable ſoever it might ſeem to *Gilbert*, *Verulam*, and divers other learned men, is not at all favoured by the experiments made in theſe wells; whether from the peculiar nature of the earth about theſe wells (which was too pretty ſolid chalk) or from ſome other cauſe, I determine not, till further experiment manifeſt it.

BUT in truth upon the conſideration of the nature of the theory, we may find, that ſuppoſing it true, that all the conſtituent parts of the earth had a magnetical power, the decreaſe of gravity would be almoſt a hundred times leſs than a grain to a pound, at as great a depth as fifty fathom; for if we conſider the proportion of the parts of the earth placed upon one ſide beneath the ſtone, with the parts on the other ſide above it, we may find the diſproportion greater. Unleſs we ſuppoſe the magnetiſm of the parts to act but at a very little diſtance, which I think the experiments made on the Abbey and St. Paul's will not allow of. If therefore there be any ſuch inequality of gravity, we muſt have ſome ways of trial much more accurate than this of ſcales, of which I ſhall propound two ſorts, which (if any ſuch difference be) ſeem capable of diſtinguiſhing and finding it out. The firſt is by the motion of a ſwing clock; for if the attraction of the earth towards its centre be leſs, the farther the body is placed below or above its ſurface, then the motion of ſuch a watch muſt be ſlower there than on the ſurface. And though perhaps the difference be ſo ſmall, as not to be ſenſible at one, ten, or a hundred vibrations in many thouſands of them, it will not be difficult to find it. But a clock for this purpoſe ought to be ſealed up exactly in a glaſs, ſo that no air may have any intercourſe with it; otherwiſe the changes of it may perhaps be rather aſcribable to the air, which is evidently of a differing conſtitution. And by this means, which I look upon as the moſt exact, I could wiſh, that trial were made at the top and bottom of ſome very high hill, that ſo by the differing velocity of the clock at the top of the hill from that at the bottom, we might be able to judge, whether there be any ſuch variation of gravity; and, if ſuch, whether it be analogous to the attraction of the magnet.

THE other inſtrument for this purpoſe may be ſome ſuch as this deſcribed in the adjoining figure, which ought alſo to be well fortified againſt the mutations of the ambient air; otherwiſe in ſo nice an experiment nothing can be done.

A B, a frame, to which is faſtned C D, a ſpring from the end of which C a thread C E is faſtned to a ſmall wheel F F, which moves on a very ſharp edge in the hole m. To the other ſide of this wheel is faſtned a ſmall long beam H H, reaching beyond the



frame A B, namely to N, to which a weight of a convenient bigneſs I being faſtned, and the inſtrument carefully conveyed from place to place. The end of the beam will ſhew upon the divided pillar K K, the differing weight of that body in ſeveral places.

Now becauſe the deſign of both theſe experiments are to find out a difference of gravitation, if there be any to the end, that comparing them with the attraction of the loadſtone, we may the better judge of this ſuppoſition; it will therefore be requiſite to make ſeveral experiments on a good magnet, for the finding out of the decreaſe of the force of its attractive power upon a body, according as it is placed at greater and greater diſtances, or according as it is further and further placed within the hollow of a terrella,

for which I have contrived and deſign to make an appropriate inſtrument. Now theſe experiments, as they are wholly new, being not attempted that I know by any hitherto, no magnetical writer that I have met with having taken any notice of it; and as the magnet affords many helps towards the finding out the nature of the magnet, and the laws and reaſons of divers other motions; ſo if this analogy between the decreaſe of attraction of the one, and gravitation of the other, be found real, we may perhaps, by the help of the loadſtone, as it were epitomiſe all the experiments of gravity, and determine, to what diſtance the gravitating power of the earth acts, and explicate perhaps divers other phænomena of nature by ways not yet thought of.

Greſham College, Sept. 5, 1667.

Honourable SIR,

WE have had ſo little worth communicating ſince your departure, that I have hitherto forborn to give you the trouble of a letter; and the buſineſs indeed of this paper is nothing but to expreſs my ſervice and duty. For moſt of the Society being out of town, we have for ſome weeks omitted our meetings, and ſo there has been nothing done at *Arundel* houſe. And the heat of the weather, till of late, has been ſuch, that I could not proceed with the experiment of the air-box, though, upon my next attempting of it, I deſpair not of bringing it to a good iſſue, which the coldneſs of the weather, and the meeting of ſeveral of the Society every Thurſday in the afternoon at my chamber, will now ſpeedily put me upon. There will be, I doubt not, very many noble experiments diſcovered by it, of which I have conceived a good number. And I hope likewiſe to add one contrivance more to this enquiry, and that is, to be able to do the ſame things in the open air, which can be done in the box, without any danger to him, that ſhall aſcend into the air; which contrivance, if I can perfect, will be of great uſe upon many other accounts. I was lately informed of a very pretty experiment of reducing the whey and curds of a poſſet back again into milk, by the nature of a certain liquor. I doubt not at all of the truth of the experiment; but I do not yet certainly know the liquor, with which it is done. I queſtion not, but that you will eaſily find many, that will do it; I have not, I confeſs, myſelf had any time to make enquiry after it ſince. I have, upon ſome trials, found a liquor, that does brighten ſteel, and extract a blood-red tincture from it, which has neither the ill taſte nor ſmell of other ſolutions of that metal. I believe the tincture may be of good uſe in phyſick, as well as the brightning of ſteel will be to mechanicks. I ſuppoſe you have heard before this from Mr. *Oldenburg*, who is got out of limbo, and now again breaths and enjoys the free air. He will not, I hope, leave off his philoſophical intelligence. I hope this peace will reduce all things again into order, and be a means likewiſe of haſtening your return to *London*, where you are very much expected and wiſhed for. I hope I ſhall prevail upon Dr. *Lower*, and for him, ſo as to get him anatomical curator to the Society. He has moſt incomparable diſcoveries by him on that ſubject, and a moſt dexterous hand in diſſecting. Some of his diſcoveries I underſtand will be publiſhed in the next edition of Dr. *Willis*'s book *De Cerebro*. Political news I doubt not but you underſtand from better intelligence. I am,

Honoured Sir,

your moſt faithful

humble ſervant,

ROB. HOOKE.

THERE were about half a ſcore of the Society met at my chamber this afternoon, where we had ſome diſcourſe of philoſophical matters, to keep the memory of that ſubject alive. I have lately contrived a new way of wheel work for clocks, watches, *&c.* which I think does much excel all the ways yet known: and indeed I think it the very perfection of wheel work, and capable of the higheſt perfection, that can be expected in that kind. There has been nothing like it yet practiſed. Many other things I long to be at, but I do extremely want time.

Mr. John Eliot *to Mr.* Robert Boyle.

Roxburg, Auguſt 26, 1664.

Right honourable,

I AM but a ſhrub in the wilderneſs, and have not yet had the boldneſs to look upon, or ſpeak unto thoſe cedars, who have undertaken an honourable protection of us. But for ſundry reaſons, I have now broke out, and have taken upon me the boldneſs to write unto yourſelf, right honourable Sir, becauſe I do ſufficiently underſtand, how learning and honour do rendezvous in your noble breaſt; and what a true friend you are to all learning, and alſo to this good work of the Lord, in promoting religion, and the knowledge of Chriſt among our poor Indians.

I DO humbly preſent my thankfulneſs to your ſelf, noble governor, and all the reſt of your honourable ſociety, for your favourable protection and diligent promotion of this work, which otherwiſe might have been ſunk and buried before this day; but by your vigilance and prudence, noble Sir, it is not only kept in being, but in a ſtate of flouriſhing acceptation with his majeſty, and other great peers of the land; which favour of yours, Chriſtian duty doth oblige me to acknowledge.

I AM

I AM bold to preſent ſome things to the honourable corporation (according as I am adviſed) by the hand of my Chriſtian friend, Mr. *Aſhurſt*. What doth more immediately concern learning, I crave the boldneſs to make mention of unto yourſelf. You are pleaſed to intimate unto me a memorandum of your deſires, that there may be a grammar of our Indian language compoſed, for publick and after uſe, which motion, as I doubt not but it ſpringeth from yourſelf, ſo my anſwer unto yourſelf about it, will be moſt proper. I and my ſons have often ſpoken of it. But now I take your intimation as a command to ſet about it. When I have finiſhed the tranſlation of the *Practice of Piety*, my purpoſe is, if the Lord will, and that I do live, to ſet upon ſome eſſay and beginning of reducing this language into rule; which, in the moſt common and uſeful points, I do ſee, is reducible; though there be corners, and anomalities full of difficulty to be reduced under any ſtated rule, as yourſelf know better than I, it is in all languages. I have not ſo much either inſight or judgment, as to dare to undertake any thing worthy the name of a grammar; only ſome preparatory collections that way tending, which may be of no ſmall uſe unto ſuch as may be ſtudious to learn this language, I deſire, if God will, to take ſome pains in. But this is a work for the morrow; to day my work is tranſlation, which, by the Lord's help I deſire to attend unto. And thus, with my humble thankfulneſs, I ſhall ceaſe to give you any farther trouble at preſent, but, commending you unto the Lord, and to the word of his grace, I remain,

Right honourable,

yours in all ſervice I can

in Chriſt Jeſus,

JOHN ELIOT.

Letters from Dr. Ralph Cudworth *to Mr.* Robert Boyle.

May 27, 1664.

Honoured Sir,

UNDERSTANDING a while ſince by Sir *William Morrice*, that you were pleaſed to expreſs your approbation and good opinion of a ſmall pamphlet of mine long ago publiſhed, concerning the Lord's Supper, and (as I apprehended him) that you wanted a copy of it; though my own were long ſince all diſperſed, yet I procured this of a friend, to preſent to you; deſiring you to accept it as a ſmall expreſſion of my thankfulneſs to you, for thoſe many worthy and learned works of yours, both philoſophical and theological, with which you have obliged the publick; in which both your ſingular piety and tranſcendent learning doth appear. And, beſeeching God to proſper your ſtudies and endeavours, that you may further inrich the world with more ſuch learned monuments, I remain,

SIR,

your moſt humbly devoted ſervant,

RA. CUDWORTH.

October 16, 1684.

Honoured Sir,

I AM extremely ſenſible of my obligation to you for your great civility, in ſending me this, and other of your learned works before. I do aſſure you, Sir, I have a very great value for them; and the age, and world is much beholding to you. I wiſh with all my heart, you would get thoſe, which are not already, all tranſlated into Latin, and printed in folio together. Then, what you ſhall ſuperadd will be eaſily collected and added afterward. And I pray God continue your life and health, that you may ſtill enrich the world with more. The writers of hypotheſes in natural philoſophy will be confuting one another, a long time, before the world will agree, if ever it do. But your pieces of natural hiſtory are unconfutable, and will afford the beſt grounds to build hypotheſes upon. You have much outdone Sir *Francis Bacon*, in your natural experiments, and you have not inſinuated any thing, as he is thought to have done, tending to irreligion, but the contrary. My good friend, Dr. *G.* ſeemed to have taken his Life of *Matt.* from the lord *Verulam*. With the renewal of my thanks, I ſhall always remain,

SIR,

your moſt obliged, and

moſt humbly devoted ſervant,

R. CUDWORTH.

Letters from Mr. Seaman *to Mr.* Boyle.

London, Oct. 5, 1664.

Honourable Sir,

UPON your honour's laying down your intention of printing that part of the New Teſtament, which I had tranſlated, I made Mr. *Diggs* acquainted with it, unto whom I had before communicated the printing thereof; but he would not hear of laying it down, encouraging me to go forward with it: ſo that he having not only largely ſubſcribed himſelf, but alſo taken much pains in getting ſubſcriptions, to help to ſupport my charge, I have undertaken to print the whole New Teſtament; not doubting, but while that, which I have already done, is in the preſs, I ſhall be able to tranſlate and prepare the reſt; being reſolved to ſpend my time in this work, that ſo (if it pleaſe the Lord to

ſpare my life and health) I may go through with it. I have here incloſed ſent your honour the propoſitions, upon which I am engaged; and what money is ſubſcribed and paid, I am to give a proportionable number of copies for; and the reſt of the copies I ſhall have towards my pains herein; and if they yield me any thing conſiderable, I ſhall thereby be better enabled to ſpend more of my time (if the Lord lengthen out my life) in works of this nature.

IN the way, that it is in, there is no queſtion, but the books will be generally diſperſed; the chief number of ſubſcribers being merchants trading into *Turky*; and that I know was one chief thing your honour aimed at: and I know your goodneſs is ſuch, that you will be well pleaſed, that I am like to have any encouragement by it. I do hereby humbly tender the premiſes to your honour, and ſhall very thankfully acknowledge it, if you pleaſe, by ſubſcription, to help forward this work in my hands. I thought it my duty to give you an account of this tranſaction under my own hand. So with the preſentation of my humble ſervice, I remain, and reſt,

your honour's moſt humble ſervant,

WILL. SEAMAN.

London, Oct. 19, 1664.

Honourable Sir,

MR. *Clarke* writeth me, you deſire to know what encouragement I have. The propoſitions I ſent your honour, I communicated only to Mr. *Diggs*, the merchant, who hath gotten the governor of the Turky company to ſubſcribe, with other Turky merchants, about an hundred pounds already; and the governor told me, that, when it hath gone through more hands, if it be not ſufficient, they will go over again; and if it were not, that they deſign to help in the printing of my Lexicon, they would have contributed to this, as a company, out of their ſtock. I humbly return thanks to your honour for what Mr. *Clarke* writeth me, you will be pleaſed to do in it: if that I have from merchants, with what your honour ſubſcribeth, defray not the whole charge, I ſhall, God willing, make up what it wanteth myſelf. This account being, what I have at preſent to tender to you, in anſwer to the aboveſaid, deſiring the Lord to preſerve your health, and ſafely to return you to theſe parts, I remain, and reſt,

your honour's moſt humble ſervant,

WILL. SEAMAN.

Honourable Sir,

I THOUGHT fit to certify your honour, that I went ſometime ſince to the Dutch miniſter, to know Mr. *De Gheer*'s mind, whether he were willing to tranſmit his Turkiſh tranſlation of the Old Teſtament into *England*, if ſo be the charge of the printing of it might be borne upon ſubſcriptions to be procured here. To which the Dutch miniſter replied, that Mr. *De Gheer* is not willing to ſend it into *England*, in regard it may be printed at leſs charge in *Holland*; but if it ſhall pleaſe any gentlemen in *England* to ſubſcribe any conſiderable ſum of money towards the printing of it, he will go in hand with it there, and they ſhall not pay the money they ſubſcribe, until they have their number of copies ſubſcribed for, delivered into their hands. Upon this, they deſire to know, what your honour will pleaſe to ſubſcribe towards the printing of it there. I promiſed to wait upon your honour in it; but not having had my health ſo well as to venture ſo far, I am fain at preſent to take this way to do it, humbly deſiring your honour, that by any of your ſervants hands, you will ſignify by two or three lines, whether or no your honour pleaſe to ſubſcribe any thing towards the printing thereof in *Holland*. With my humble ſervice preſented to you, I take leave to reſt

your honour's moſt humble,

and affectionate ſervant,

WILL. SEAMAN.

FROM my houſe in *Middle-Moorfields*, *London*, at the lower end of *Whitecroſs-Alley*, the firſt day of May, 1683.

Letters from Dr. More *to Mr.* Boyle.

Chriſt-Church-College, June 5, 1665.

SIR,

I RECEIVED your excellent Treatiſe of Cold a good while ſince, but deferred to return my thanks, that, upon the peruſal thereof, I might be enabled to do it the more amply. But my occaſions have been, and ſtill are, ſuch, that I cannot yet give myſelf that full pleaſure of thoroughly peruſing ſo ſingular a treatiſe, and of ſo ſelect a ſubject. But ſo far as I have gone, I am ſure it affords extraordinary delight to the reader, and is no ways unworthy of ſo illuſtrious an author. Sir, you will infinitely oblige poſterity, by the records of your ſo faithful and multifarious experiments, which you have tranſmitted to them in your ſeveral writings. They certainly are of far greater conſequence, as your laſt has but juſtly taken notice, than the framing of any haſty hypotheſes, though witty, and, within ſome circuit of conſiderations, pretty coherent. *Opinionum commenta delet dies, naturæ judicia confirmat*; it is the ſaying of *Cicero* ſomewhere, but an undoubted prognoſtick of a durable honour done to your name, whoſe repute with poſterity muſt have no ſuch firm foundation, than the conſtancy of nature, of which your writings will now find ſo true a copy, as that future appeals will

be

be made to them amongſt the learned, as to the judicature of nature herſelf. This is the due acknowledgment, that all the world owes you, but none can make more readily and willingly than,

Honoured Sir,

your moſt humble, and

affectionate friend and ſervant,

H. MORE.

Chriſt-Church College, Nov. 27, 1665.

SIR,

I HAVE forborn all this while to return you thanks for your kind acceptance of that ſmall ſignification of that reſpect and honour I have for your perſon and virtues; becauſe, till within a few days ago, I had no information of the affair was in the ſubject of the incloſed letter. But now I can tell you, with what great thankfulneſs Mr. *Fulwood* does embrace the terms ſpecified in your letter, and alſo how glad his brother, my acquaintance, now in the town, is of this opportunity given to his brother, the phyſician (for that is his employment) to improve himſelf under ſo excellent and knowing a perſon. When you have uſe for him, if you pleaſe to ſend me word, he ſhall have notice of it, and wait upon you. I am much obliged to you for your favourable judgment touching my idea. If any thing like you thus by pieces, I know you will find a new pleaſure in conſidering the congruity of the whole; but moſt of all, if your leiſure and patience will ever permit you to peruſe my Synopſis alſo, and compare it with the idea. What you conceive of ſo free ſpeaking and writing, that it is likely to procure me many adverſaries, I am not only of the ſame opinion, but have the certain knowledge and experience of it; and may very likely find the effect of it in a rude manner this very day; Dr. *Sparrow* viſiting us this afternoon: but knowing ſo well what is at the bottom, I ſhall, I hope, bear cheerfully whatever he is able to do againſt me. For I heard one ſay, that he proteſted he would proſecute my opinions as long as he lived. And what opinions nettle him and Mr. *Thorndikele* moſt, is not hard to conjecture. I muſt confeſs, it is very hard for me to ſuppreſs my zeal for the proteſtant religion; and I thank God it is ſo. You ſee how the caſe ſtands with me, and therefore you will excuſe me, if I abruptly take leave to ſubſcribe myſelf,

Honoured Sir,

your moſt humble,

and affectionate ſervant,

H. MORE.

SIR, I heartily thank you, for your care in directing me to ſo excellent a medicine, as you ſpecify in your note, againſt my quartan; but my quartan, as it happened, was cured by this diatrion, faſting, ſack, and mathematicks; eſpecially *Oughtred*'s *Clavis*: of this more when we meet. If they out me out of *Chriſt* college, my abode will be more at *London*.

Chriſt-Church College, Dec. 4.

Honoured Sir,

MR. *Foxcroft* being at my chambers yeſterday, and acquainting me ſo explicitly how you have taken offence at what concerns you in my *Enchiridion Metaphyſicum*, it has quickened me to do that, which I was ſometimes thinking to do, ſince I ſaw you laſt. For I had ſome ſuch inklings before now. But when I was with you, you ſeemed not to be concerned for yourſelf, but for *Des Cartes*. I ſhall now briefly anſwer as touching both. And truly, whatever I have writ in that book, touching *Des Cartes*, I confeſs, I have not the leaſt diſlike of it, it being ſo exceeding requiſite for me to do as I did. I have, from my very firſt letters to *Des Cartes*, till this laſt book of mine, always expreſſed my opinion, that this mechanical way would not hold in all phænomena, as I always verily thought: but this would not ſave us from being accounted amongſt the wits, one of their gang; and a perfect Carteſian, as to the hypotheſis; and, indeed, no leſs than an infidel and atheiſt. And I was informed out of *Holland*, from a learned hand there, that a conſiderable company of men appeared there, mere ſcoffers at religion, and atheiſtical, that profeſſed themſelves Carteſians: and that his philoſophy may naturally have ſuch an influence as this, I can neither deny, nor could conceal in my preface to this book; for it had been to the prejudice of religion, and to my great reproach, for me, who have been, from my youth to this very day, ſo open a ſtickler for the ſupport of natural religion, and for Chriſtianity itſelf, in the beſt mode thereof, to be found of ſo little judgment, as not to diſcern, how prejudicial *Des Cartes*'s mechanical pretenſions are to the belief of a God. Certainly, all thoſe of the atheiſtical party, that have obſerved my zeal in the behalf of religion, in almoſt all my writings, muſt, as once I heard a known phyſician ſay of them of our profeſſion, that God Almighty has ſent none but a company of fools upon his errand, take me to be one of the chief of them; or think me a juggler and deceiver, I not declaring againſt that philoſophy, which is the pillar of many of thoſe mens infidelity, and of their atheiſm; and it is not a week ago, ſince I ſaw a letter, that informed me, that *Spinoſa*, a Jew firſt, after a Carteſian, and now an atheiſt, is ſuppoſed the author of *Theologico-Politicus*. I ſuppoſe, you may have ſeen the book. Wherefore what could I have done leſs, than declare my ſenſe of the Carteſian philoſophy, and vindicate myſelf from the imputation of ſo fond a blindneſs, as not to be aware of the danger of that philoſophy, if it be credited; and, which

is beſt of all, to put it quite out of credit, in that ſenſe I oppoſe it, by demonſtrating the great weakneſs thereof, in its pretences of ſolving, though but the eaſieſt and ſimpleſt phænomena, merely mechanically? which, I think, I have done irrefutably, nay, I am unſpeakably confident of it: and have therewithal ever and anon plainly demonſtrated the neceſſity of incorporeal beings; which is a deſign, than which nothing can be more ſeaſonable in this age; wherein the notion of a ſpirit is ſo hooted at by ſo many for nonſenſe. This yet I am very confident in myſelf, I have proved over and over again, by invincible arguments, to be no figment in this diſcourſe: which, whatever the opinions of other men are, is a ſatisfaction to my own mind, which I value more than any thing this world can afford me. And if in a compliment to *Des Cartes*, I ſhould not have taken my full ſtroke at this daring monſter, that ſtruts thus confidently in this preſent degenerate age, I had been perfidious to the church of God, and to the kingdom of his ſon Jeſus Chriſt; whom, however I compliment others, I am bound to the utmoſt of my power really and cordially to ſerve.

AND truly I expected, that all, whoſe hearts are ſeriouſly ſet upon God and religion, would give me hearty thanks for my pains: but, however, my reward is with him, that ſet me on work: and as I do not doubt, but my diſcourſe is firm and ſtrong from the beginning to the end, ſaving in ſome few miſtakes, which were no errors of my judgment (as that quotation in the margin of the preface, pag. 3, where it ſhould be part 2, art. 21; and pag. 218. line 11, where it ſhould be, *quam dimidium ejus, quod globuli occupant*; and line 13, *ſpacium ille dimidium*, for ſo it was in my Engliſh Eſſay; but I was mindleſs in the tranſlating of it, and the context plainly ſhews it muſt be ſo) ſo had I had a very great ſatisfaction in my performance, had I not had the ill hap to give offence to that incomparable perſon Mr. *Boyle*; which, I profeſs, I could not foreſee, doing no other thing to him, than what, if it were done to myſelf, I ſhould take no offence at; and therefore, I could not perceive aforehand, what would be the event, having acted according to the royal law of equity; which might well make me careleſs of imparting to him my purpoſe in that matter; and the experiments of his, which I drew into my diſcourſe, they were of that excellent importance for the deſign of my book, and the demonſtration of the grand point in hand, that I could not by any means omit them, having mentioned them alſo in ſeveral places of my writings, as a main pledge of the tenets I ſo much contend for; that the phænomena of the world cannot be ſolved merely mechanically, but that there is the neceſſity of the aſſiſtance of a ſubſtance diſtinct from matter, that is, of a ſpirit, or being incorporeal, as I muſt confeſs, I do conceive myſelf moſt firmly to have concluded from theſe experiments; for which, I ever hold the world and myſelf obliged to you: and though there be an infinite diſparity betwixt your experience and experimenting and mine, yet I did preſume, for thoſe few I did conſider, that I might thoroughly underſtand them ſo far as concerned my purpoſe, and make ſafe uſe of them: and if I be miſtaken in my inference from them, as to the main, I am ſo groſly and unexpectedly diſappointed by my reaſon, that I ſhall never hereafter truſt mine own, or any one's elſe ſubtil reaſonings in philoſophy; but altogether endeavour after as perfect innocency as I can; and then I hope my ſoul in the other world will be gathered to the good, whoſoever's are gathered to the wiſe. But I was ſo tranſported and warmed with the light and clarity of my reaſonings in this diſcourſe, that I hope, if in ſo full a career of heat and zeal for the main points I labour for, any thing has happened, that may ſeem leſs diſcreet, your great candour and Chriſtianity will eaſily pardon it; and that ſo great and virtuous a ſoul, that is acquainted with ſuch ſentiments of the mind, as infinitely ſurpaſs all notions and ſpeculations, that are not ſubſervient to that end, will not think himſelf damnified, if other conceptions, that make nothing to that noble end, be aſſaulted by any one; eſpecially, if they appear ſound after the aſſault; and if they do not, yet there is the gain of a new truth if one will, or the loſs of ſuch a victory: ſo little hurt is there in philoſophical oppoſitions amongſt the free and ingenuous! For all things are but fancies, ſaving the life of God in Chriſt, and what tends thereto. And I have found it a great inconvenience to find myſelf vulnerable in any concerns but of that, but a convenience to be wounded by any good hand of providence, which might cauſe me to retreat into what is the beſt; nor let my ſoul out unto vanities, and that which profiteth not; which might make this fatal miſtake of mine more grateful, if I could imagine it needful to a perſon ſo excellently accompliſhed. But come it in what circumſtances it will, Sir, I will aſſure, it came from one, that does very highly honour you and love you, and whatever diſpleaſure you may conceive againſt him, is reſolved, whether you will or no, to love you and honour you, and wiſh you all good poſſible, and, in this ſenſe and reſolution, does heartily ſubſcribe himſelf,

Honoured and dear Sir,

your moſt humble, and

moſt affectionate ſervant,

HEN. MORE.

From Mr. R. Baxter *to Mr.* Robert Boyle

June 14, 1665.

Moſt dear and truly honoured Sir,

I WILL not accuſe you for tempting me to be proud, by the favour of ſo worthy a per-

a perſon as yourſelf, expreſſed in your viſit, and the gift of your many excellent books. For it is no diſhonour to good, that *omne malum eſt ex bono*, nor to God himſelf, that none giveth ſo many occaſions of ſin, whilſt none is ſo far from being the cauſe. But I will rather look back to one of my old leſſons, that our greateſt benefits muſt be received in the moſt timorous watchful poſture. The recreations, which I have oft taken in your experimental philoſophy, and other ſuch writings, are not like thoſe, which ſome men ſeek in cards and ſtage plays, and other murderers of precious time, whoſe fruit is nominally ſome true commodity, and really in hand; ſome unwholeſom ſenſual delight, and finally the ſting of ſorrow, when irrevocable time is gone. But they have been a profitable pleaſure, which prepare not for repentance. But your plea for ſcripture ſtyle, and your Seraphick Loves, and the noble deſigns of your Arabick publication of *Grotius*, and now your pious meditations and reflections, do call to me for greater reverence in the reading of them, and make me put off my hat, as if I were in the church; and have not in vain excited me to the expectation of ſome higher benefit, as they ſtand nearer to my ultimate end. I read your theology as the life of your philoſophy, and your philoſophy as animated and dignified by your theology, yea indeed as its firſt part. For God himſelf beginneth the holy ſcriptures with the doctrine of phyſicks: and he, that will handle the covenant and laws of God, muſt deſcribe firſt the covenanters God and man, the conſtitutive parts of the univerſal kingdom. He that will juſtly frame a panſophy (as *Commenius* calls it) muſt begin with ontology, of which God and man are the parts, which we are moſt concerned to know: and having firſt gone through the doctrine of entities, muſt come down to that of conception, and expreſſion, and action. And he that knoweth, that this is the difference between our knowledge of God in this life and the next, that here is known as in a glaſs, and there by intuition, will neither with the illiterate deſpiſe the glaſs, nor with the atheiſt and prophane overlook or deny the face, which it repreſenteth. Such as theſe laſt I have heard you complain of, and find by your remedies, that you are not unacquainted with the lamentable increaſe of this diſeaſe. I was naturally as much inclined as others, to play with the gilded leaves and outſide of my books, and handſomly depaint the letters before I underſtood the ſenſe: to take up my time in the ſearch of creatures, and words, and circumſtances, and to mortify all theſe by ſeparating them from God! And it was not ſoon enough that I reduced all my learning to the doctrines, *de fine ultimo, et de mediis* practically, and that I ſtudied and eſtimated all the means according to their places and value in their tendency to the end. But when God removed my dwelling into a church-yard, and ſet me to ſtudy bones and duſt, and by a proſpect into another world, awakened my ſoul from the learning of a child, and ſhewed me, that my ſtudies muſt not be play, but affective, practical, ſerious works; I then began to be conducted by neceſſity, and to ſearch after truth, but as a means to goodneſs, and to perceive the difference betwixt a pleaſant eaſy dream, and a waking working knowledge. He, that hath well learned in the alphabet of his phyſicks, wherein a man doth differ from a brute, hath laid ſuch a foundation for a holy life, as all the reaſon in the world is never able to overthrow. For by knowing his faculties and capacities, he will quickly know their end and uſe; and his relations to his Creator, his efficient, dirigent, final cauſe: that his nature was formed to be holy, even to know, and love and ſerve his Maker, as truly as the lower creatures are formed for our ſervice! That to love God above all, and to ſerve him with all our powers and gifts, is as unqueſtionably the duty of man, as it is the uſe of a horſe to carry us, or of a knife to cut, and much more, becauſe the aptitude and obligation were more eſſential to us: and he will as eaſily know, that all this duty is not to be performed in vain; and that the rectitude, perfection, and uſe of nature, was never intended by our Creator to be our miſery; and therefore that holineſs is the way to happineſs. And as I never met with the infidel, that durſt ſay, that he is certain, that there is no future life of reward and puniſhment; ſo it is moſt eaſy for unprejudiced reaſon to diſcern, that the probability or poſſibility of an endleſs joy or miſery hereafter obligeth us to provide for it, whatever it coſt us in the world! And nature itſelf, by the very revelation of that probability or poſſibility, hath made it every wiſe man's duty to make it the chief care and buſineſs of his life to obtain that happineſs, and eſcape that miſery; and to contemn all the hopes and fears of this world, which ſtand againſt it: and conſequently that he liveth againſt the law of nature, who liveth not a holy life. And then he muſt conclude, that either really there is ſuch a life of happineſs, which we are naturally thus bound to ſeek, and ſuch a danger, which we muſt labour to avoid; or elſe that God hath deceived man in the very frame of his nature, and made both his nobleſt faculties, and the chief duties of his life to be deluſory, fruſtrate, and our torments; and that he loſeth and ſuffereth moſt, who is trueſt to his God and conſcience, which the knowledge of God will eaſily confute. He reproaches his Creator, who ſaith, that he gave man higher faculties than the brutes, to know, and love, and ſerve his God, and this that he might be ſo much more miſerable than the brutes, by his foreſights, labours, and fruſtrations. Beſides what I have oft ſaid, that the world neither ever was or can be governed according to the nature of man, without the fears and hopes of life to come! Were it not for theſe, there would be no law or virtue, but carnal intereſt, craft, and ſtrength: and he were a fool, that could not with probable ſafety murder or undo him, that ſtandeth in his way. It is

well for the world, that beaſtly infidels do oft want wit to do miſchiefs, as well as to know the truth: and better yet, that atheiſm ſeldom doth totally preclude their proſpect into another world, and conquer all thoſe fears and hopes; and yet better, that atheiſts have ſeldom the government of the reſt: and that thoſe, that have wit and power enough to do miſchiefs, have uſually the wit to ſee why they ſhould not do it. I ſpoke from my heart, when I told the world, that every man is a ſaint, a brute, or a devil, as he is either holy, ſenſual, or malignant. I thank you therefore for all your books, but moſt for thoſe, which have moſt for God: for, as to the ſubject, that which ſtands next to heaven is beſt: there are my hopes, and that way lye all my buſineſſes and concernments. What a poppet play is the life of ſenſuality, worldlineſs, and pride? And how low a game is it, which emperors and commanders play, who ſeek no higher things in compariſon of a humble Chriſtian, who by the conduct of the word and ſpirit of God, is ſeeking the immortal pleaſures? If theſe be not my happineſs, I ſhall conſent to have no other, much more if they be. Let me have more than this malignant diſtracted world affords, or let me have nothing. Let me be happy longer than ſeventy years, or let me never be happy. How I am eſteemed, or called, or uſed here, for ſo ſhort a time, I deſire to make it but little of my care, nor much to regard, whether ſo ſhort a dream be ſad or pleaſant. He loſeth nothing, that loſeth but this ſhadow: and in the end he will confeſs, he hath got nothing, who hath got no more. If the poſſibility of endleſs joy or miſery prevail not with me againſt all that the world can offer, I will be judge againſt myſelf, and freely confeſs, that by ſinning againſt reaſon, I forfeit all pretenſions to felicity, and if there be hell, it is my due.

THE matter of your book having occaſioned all theſe words, I muſt thank you for it alſo as to the manner, and that upon a double account. 1. That you call men to the manly work of meditation, to waken the ſleepy reaſon of the world, and bring it into exerciſe: moſt of the world would become much wiſer (and conſequently better, and conſequently happier) if they could be brought to be more conſiderate: if they were but ſhut up in the Jeſuit's dungeon one hour in a day, to think ſeriouſly of God, and of their happineſs and duty, and were forced to give an account of their thoughts to ſome ſober perſon! For the matters of God and their ſalvation are ſo great, and have ſuch evidence, that if they would but think oft and ſeriouſly of them, ſure they would think rightly of them at the laſt, at leaſt ſo far as to ſet them in the way, and to call off their hearts from all that, which now diverteth and deceiveth them. Would they but ſometimes lay by ſenſuality, and think ſeriouſly what all the pleaſures of this world will prove at laſt, they would read in the dark the Spaniſh proverb, *The world is a carrion, and they are dogs that love it.* But men are ſuch hypocrites and atheiſts, that while their clothes, and words, and all that is ſeen of men, are compoſed as beſeemeth men awake; their thoughts, which are ſeen to God alone, are wilfully left ſo diſcompoſed and diſtracted, as if they were dreams or Bedlam-ravings: and if one day's thoughts were written down, and read over before a ſober company, they would meet with more ſuch cenſurers than me. Senſuality having hired reaſon for its ſervice in all the ungodly, doth ſet them on the purſuit of a miſtaken intereſt, and involveth them in ſuch a multiplicity of diſtracting buſineſſes, with turbulent paſſions and deceiving luſts, that ſometimes I have queſtioned, whether a wiſe man in his ſleep be not more likely to uſe his thoughts aright, than ſuch men as theſe while they are awake. 2. And your ſpecial way of occaſional meditation, I take to be exceeding uſeful! Your examples are the tranſlating of the ſeveral creatures into a language underſtood; ſo that it will teach men, when they ſee the words (the things) to ſee withal the ſignification (the uſe:) as thoſe, that know not only the materials of an apothecary's ſhop, but alſo the medicinal uſe of the ſimples and compoſitions. I know, that ſet methodical meditations are moſt excellent for thoſe, that are able to manage them: but ſhorter occaſional meditations are every man's hourly employment: the weakeſt heads, that cannot hold their thoughts to method, may manage theſe ſhort reflections to their benefit, and without any danger of overſtraining their imaginations. As the moſt learned muſt not diſdain this way of cogitation, ſo women and weak perſons may well make it their frequent profitable work. A little and often is the diet of the infirm. And thoſe are the beſt writings, which are ſuited to the moſt, and the moſt neceſſitous. If the attempt you have here made to draw on yourſelf, or ſome other well furniſhed perſon, to write ſuch a commentary upon all the moſt ordinary occurrences of each day, what an excellent help will it be to them, that need ſuch an interpreter, that they may walk in their gardens and meadows as phyſicians, and not as mere huſbandmen, and may hear every creature praiſe its Maker, and the mute to ſpeak the heavenly dialect? "All thy works ſhall praiſe thee, "O Lord; and thy ſaints ſhall bleſs thee," Pſalm cxlv. 10.

IT is grown a controverſy, whether a contemplative or an active life be the more excellent? and whether it be more advantageous to holineſs, to ſhut up our ſenſes againſt the creature, and retire to an abſtracted communion with God; or to make ſo much more uſe of creatures, as we would attain to more of the knowledge of the Creator, becauſe it is but in a glaſs, that here he can be known. Doubtleſs in our innocency this was the book, which man was made to learn and read. And it is ſo far from the intention of the Redeemer, to cloud the glory of the Creator, or to diminiſh our higheſt reſpects to him, as that it is indeed his office to redeem, and ſave, and

reſtore the creatures to their Maker's favour, love, and ſervice, and ſo to their primitive uſe and end. In innocency God appeared to man ſufficiently amiable in his worſhip; but to a guilty, curſed, condemned ſinner, bound over to everlaſting puniſhment, it became impoſſible to love the God, that doth condemn and puniſh him: but we love him as our Redeemer, that we may love him again as our Creator: and thus Chriſt is the way to the Father, and faith is the way to love, and the goſpel is far from abrogating nature's law; and on the Lord's day we commemorate the wonders of redemption, in order to our juſt admiring the creation; and the ſeventh day's work is not aboliſhed, but incluſively to be performed on the firſt. So that indeed ſo far as we are yet corrupt and weak, it is ſafeſt to retire as far from the creature as well we can; for experience aſſureth us, that the objects of ſenſe, though they may and muſt be uſed to our helps, ſuch powerful diverters and deceivers of the mind, and clogs in our higheſt contemplations, that ordinarily they are the moſt terrene and ſenſual men, who are moſt buſied in terrene and ſenſual things. But ſo far as we are reſtored ſanctified perſons, we are above the ſnare, and may ſee and love God in his creatures, and ſerve him by them, and make them all the ladder of our contemplations, and utenſils in our father's work. And thus the world is no worſe to us, than a good horſe, and a fair way, and a good inn, and company, and weather to a traveller, or as a ſhip, in which we muſt ſail to the harbour of endleſs reſt. And thus indeed we have nothing to know but God, and the ſignificant ſanctified creature; nor nothing to do but to ſee and love him in himſelf and his works, and ſerve him by them. But a man muſt know himſelf, that will know his duty. And if all men, then the weak, eſpecially, have need to watch as well as to pray, Lead us not into temptation. And the new book, which Chriſt hath given us to know God by, is much more legible (now) and leſs dangerous, than the old blotted book of the creation. The darkneſs of which, and the perils in uſing it, are grown ſo great, that it hath tempted ſome learned men to think, that as goſpel remedies will not perfectly cleanſe us from ſin till death, ſo till then they will not bring us up to be fit for the higher form, which we fell from, even to know and love the Creator purely in his creatures, and that there we ſhall be returned to this employment, when all "Things are reſtored," Acts iii. 21. "And the creature itſelf ſhall be delivered "from the bondage of corruption, into the "glorious liberty of the ſons of God," Rom. viii. 21. "And the kingdom ſhall be deli-"vered up to the father, that God may be "all in all," 1 Cor. xv. 24, 28. "But we "are not yet ripe to know the ſtate, or uſe "of the new heaven or new earth, wherein "dwelleth righteouſneſs," 2 Pet. iii. 13. "It "is enough to know, that it will be to the "glory of the bleſſed Creator, who is now "diſhonoured by his depraved works; and "that we ſhall be with Chriſt, and ſee his glory, "and ſee, and love, and praiſe our Maker," John xvii. 24. & xii. 26. 2 Cor. v. 7, 8. Mat. v. 8, *&c.* For my part I will be none of thoſe, that looking at ſimple duty, and bare poſſibility, do ſet the hardeſt leſſons to the youngeſt, and draw men to venture too boldly into the world, under pretence of ſeeing or of ſerving God. I will not bid a child leap into a river, becauſe a ſtrong man, that can ſwim well, can get through it; nor will I ſet an infant on a luſty horſe, becauſe he may expedite another man's journey; nor ſet beef and ſturgeon before the ſick, becauſe a ſound man's ſtomach can digeſt them. Nor yet will I ſo retire from the creature, as to ſhut my book, and reject the glaſs, in which the image of God appeareth; or to hide my talents for fear of the auſterity of my Lord! But for the direct illumination, ſanctification, and comfort of my own ſoul, I will deſire to improve opportunities of contemplation, (aſcending from creatures to the moſt abſtracted apprehenſions, that I can reach:) and for the ſerving of my Lord, and the good of others, I will be as glad of the opportunities of profitable action, believing, that I ſhall loſe nothing by it in the end, but that doing good is the ſureſt way to receive good: and when God reſtraineth me from out of theſe (as now he doth from the latter) I ſhall be glad, that I may be employed in the other. The ſum is, though a contemplative life may be more predominant with ſome, and an active with others, yet there are none but the utterly impotent, who are not obliged to uſe them both: but it is our contemplation, which fitteth both for action and fruition. While I intended but to thank you for your excellent book, this ſuperfluity of words hath made that eruption, for which I may crave your pardon, remaining,

Honourable and worthy Sir,

your very much obliged

and eſteeming ſervant,

R. BAXTER.

Mr. Boyle's *Anſwer.*

[From the original in the library at *Red-Croſs ſtreet.*]

Worthy Sir,

WHEN I thought it my duty to preſent you thoſe trifles, of which you are pleaſed to take ſuch obliging notice, I did not think, that they ſhould put you to the trouble of a long letter, or procure me ſo many good inſtructions, as that is repleniſhed with. But I was much more ſurpriſed to find, that you look upon that as a temptation to an over great eſteem of yourſelf, which is ſo defective an expreſſion of the eſteem, your devout and happy compoſures have juſtly given conſiderabler readers, than I pretend to be, of you:

you: it is more my ſatisfaction, than my wonder, that you have found an innocent divertiſement in the peruſal of what I have ventured to write about experimental philoſophy.

You are too much a friend to contemplation, and too well verſed in it, to be an enemy to that ſort of learning, that furniſhes it with a very copious, and diffuſed, as well as noble object; and there are divers things, that ſpeak you to be none of thoſe narrow-ſouled divines, that, by too much ſuſpecting natural philoſophy, tempt many of its votaries to ſuſpect theology. I am very glad to find, that your kindneſs to the deſign of my Occaſional Reflections gives you ſuch favourable thoughts of them. And your approbation comes the more ſeaſonable, becauſe, though at *London*, they have been more generally fortunate, than could be well expected, and have not received an ill character, even from divers of the poets and wits themſelves (ſome of them indiſpoſed enough to give a good one to any thing, that aims at the promoting of piety) yet in another place I find, that theſe harmleſs papers have not eſcaped the cenſure of three of our learned men, who yet ſeem not to diſlike them for their own ſake, but mine, pretending, that compoſures of that nature might well have been ſpared by a gentleman, whom they are pleaſed alſo, on this occaſion, to look upon as a philoſopher, and not unfit to write books in that capacity. But though I had written with no higher aim than applauſe, I ſhould not be overmuch diſcouraged, by ſo ſmall a number of thoſe, who themſelves would not have diſliked a book, if another had been the author. And as for what you are pleaſed to hint about the uſefulneſs of making meditations, upon the moſt uſual occurrences, I am ſo much of your mind, that, before I laſt waited on you, I was telling ſome friends of yours and mine, that I ſhould be glad to ſee ſuch a work undertaken, by a pen likely to go through with it, which mine is not, partly becauſe it is preingaged to ſubjects of a very different nature, and partly becauſe the expectation, that many have of philoſophical diſcourſes from me, would make a work, that does ſo much more properly belong to divines, unacceptable to many readers; and therefore ſince we agree in our wiſhes, that the thing were done, and you both are far more able, and otherwiſe qualified to undertake it, I ſhall think the deſign more excellently well lodged, if you would think fit to take it into your hands; wherein, as in all your ſtudies and attempts, that tend to the good of ſouls, you will, I hope, eaſily believe, that a moſt happy ſucceſs is heartily wiſhed you by,

Worthy Sir,
your moſt affectionate
and humble ſervant,
ROB. BOYLE.

Superſcribed,

To my reverend and highly eſteemed friend, Mr. Richard Baxter, *at his houſe at* Acton.

Letters from the lady Ranelagh *to Mr.* Robert Boyle.

January 7.

My Brother,

YOURS, which incloſed one to my brother *Corke*, and another to capt. *Whiteby*, came to my hands by the laſt poſt: thoſe two I yeſterday diſpatched; and that, which by the poſt before came to me for *Will. Somers*, I endeavoured to have delivered to him with a like diligence; but his being out of town kept me from effecting it. He is now returned, and has it, but was fain to come to me, to make him underſtand what you meant by the count. I would gladly have got the return you deſired from him to have ſent you by this diſpatch, but he ſays, he cannot get it, till the next, and then it ſhall be ſent you. I hope the misfortune you are fallen under, by the ignorance or miſtake of your lawyer, is no new one; but if it be, I promiſe myſelf, that God will make you a greater gainer by thoſe diſappointmens he orders you to meet with in your fortune, than if you had received the entire revenue thereof, experience being a greater treaſure than money, to thoſe, who are inſtructed to make a right uſe thereof; and for your eſtate, I ſhould not wiſh it more, unleſs I had ſeen, that God had taught you to employ it ſo, as to make it uſeful both to your ſelf and others. But having ſeen that, I durſt truſt you with it, if it were ten times as much, and cannot but think, that as much as it is, or honeſtly may be made to be, ſhould rather be yours than any of your agents. Our young earl of *Kildare* I have perſuaded into a ſenſe of the fitneſs of his having ſome perſon of conſcience, knowledge and diſcretion, as alſo of civility and good faſhion, to be with him as a companion, that might alſo do him ſuch ſervices, as a man not ſo qualified could not do; and he is willing to give ſuch a one fifty pounds a year, his diet, lodging, waſhing, the uſe of a ſervant of his, to do neceſſary things about him, and a horſe kept at his charge for him to uſe upon his or his own occaſions; and deſirous, that you would give yourſelf the trouble of enquiring him out ſuch a one; which I beſeech you do, and take the aſſiſtance of honeſt Dr. *Cox* herein, for whoſe and for his wife's preſervation from that loathſom diſeaſe I deſire to be truly thankful to him, who was their preſerver, and who in them has preſerved me two friends, to whom I have been very much obliged, and am very really affectionate; and ſo I beſeech you aſſure them from me, and preſent them my unfeigned ſervice. For Mr. *Waller*, I never heard one word from him, ſince I left him, but what you ſaid in your laſt; and I know his calling as a poet gives him licence to ſay as great things as he can, without intending they ſhould ſignify any more, than that he ſaid them, or have any higher end, than to make him admired by thoſe, whoſe admirations are ſo volatile, as to

be raiſed by a ſound of words; and the leſs the ſubject he ſpeaks of, or the party he ſpeaks to, deſerves the great things he ſays, the greater thoſe things are, and the greater advance they are to make towards his being admired, by his poetical laws. Therefore if he would be but as little proud of ſaying great things to me, as I hope I ſhall be in hearing them from him, he would, I am apt to think, eſcape ſome guilt, that now his fine ſayings lay him under; and I could never give my ſelf a reaſon, why he, who can ſay ſuch things upon things that ſo little deſerved them, ſhould be ſo unwilling to apply that faculty to thoſe ſubjects, that were truly excellent, but this, that there his ſubject would have been debaſed by his higheſt expreſſions, and he humbled in the exerciſe of his wit; but where he has employed it, his ſubjects have been raiſed by his fancy, and himſelf by reflecting upon it. I ſhall therefore return his great profeſſions with a plain hearty wiſh, that he may partake in gifts more excellent than his wit, and employ that for the time to come upon ſubjects more excellent than hitherto he has done; and, without compliment, I ſhould gladly be ſerviceable to him, or his wife, to whom I am a ſervant, upon much better accounts, than he hitherto makes it poſſible for me to be to him. I ſhall only mind you, that our young earl needs one, that may know how a little to govern and direct, without letting him ſee he intends to do ſo; and, as ſoon as you can find ſuch a one, I beſeech you, give notice thereof to me, that order may be taken for his coming over by

Your *K. R.*

June 3.

My Brother,

THIS incloſed, my brother *Corke* ſends me word, contains an account of what he has done in your affairs, to which he ſays a ſpeedy anſwer from you will be neceſſary, to enable him to proceed therein to your advantage. A liſt of your Connaught lands I received from him with this, and not before. I have already ſent two of them to the two perſons he and I have engaged to try what rents they may be raiſed to; and when I receive their accounts, I ſhall, God willing, haſten them to him, that he may purſue what will moſt tend to your benefit, whoſe wearineſs of a place and company, that, inſtead of helping you to improve your time, does, in ſpite of your teeth, ſteal it from you. I wonder not at, nor do I think there is any thing we are more concerned not to conſent to, than the parting with that treaſure, unleſs it be towards the acquiring or performing ſome of thoſe things, in order to which it was given us, ſince all other talents muſt be improved, whilſt we are here, by the help of that, and when our meaſure of that is ſpent, our work ends, and we muſt begin to receive thoſe recompences, that we ſhall be receiving for ever, and which will be ſuitable to what we have done with and in our time. The other being from one of your own fraternity, who thinks himſelf in the higheſt claſs of your philoſophical Society, will, I preſume, without my ſolicitation, be afforded a ſpeedy return. I therefore only beg that may come through my hands open, as this does, and for gratitude for that favour I ſhall ſolicit a reply. If this find you in the Weſt, let me beſeech you to preſent my humble ſervice to my two lady *Briſtols*, and wiſh you would diſappoint *Frank* by bringing a wife of your own to *Stalbridge*; a buſineſs I muſt ſtill mind you of, though you give me cauſe to doubt, you will as hardly pardon me thoſe few words, as the reſt of the trouble given you here by

Your *K. R.*

IF this find you at *London*, let it a little call upon you to be Mr. *Worſley*'s advocate to *Broghill*, who is of that committee, where the act is like to paſs, that, if not prevented, will put him out of his place.

SOME ſingle piony roots I beg may be ſent me, fit to plant here, if you can without too much trouble get any.

December 3, [1659.]

My Brother,

BEING able by this to let you know, that my brother *Corke* came ſafe hither yeſterday, I hope by the next you will aſſure me, you will not be long from hence; and if I may know, how you mean to order yourſelf, and may be employed in getting you accommodated with lodging, either here in this poor houſe, as far as its room will go, or near hereabouts, or where elſe you ſhall chuſe, I hope I need not aſſure you, you do me but right in believing, I ſhould gladly be ſet to work in your ſervice, though of ſo inferior a nature in compariſon. Yeſterday I received out of France from Mr. *Oldenburg* this relation, which he had from *Montpellier*, and which he deſired me to communicate to you, and upon it to beg your thoughts, and thoſe of your brethren philoſophers, he aſſuring, that the matter of fact is indubitably true: A woman of ſeventy years old, having lived about twenty four years a widow, and often complained to phyſicians of a heavy ſtony burden ſhe carried in her belly, did precipitate herſelf out of a high window, and thereupon died ſhortly after; but being opened at *Avignon*, was found to have in her belly, where the intrails lie, commonly called abdomen, not in the womb, a child, of the bigneſs of one of ſix month's ordinary growth, but with an extraordinary big head, which had begun to petrify, and eſpecially his head turned into a gypſy or chalky ſubſtance. This is ſurely ſtrange, and I long to receive your thoughts upon it. Our publick news you will for the moſt part find in the print, in *Monck*'s laſt letter. Commiſſioners are going down to *Newcaſtle*,

caſtle, as he deſires; and ſome talk here has been of a petition ſetting on foot by a great number of prentices, whereof notice was given by my lord mayor to *Wallingford*-houſe, and ſuch order taken there, that they ſay they are quieted. Through rich mercy we yet continue in peace and quiet. A rational diſcourſe with ſome very equal propoſitions I yeſternight received out of France, which, if you give me not hopes of ſeeing you ſpeedily here, ſhall, God willing, be ſent you. I come juſt now from my brother *Corke*'s, where was alſo my ſiſter *Warwick* (and they all your ſervants) but alas! the entertainment of lords, ladies, and reaſonable creatures, are yet ſeveral things, to the great grief of

Your *K. R.*

MY girls are your ſervants.

I AM with many thanks to acknowledge the receipt of the two books by the carrier, that you were pleaſed to ſend me for myſelf, and to be ſent into France.

October 12.

My Brother,

IT has pleaſed God to bring us ſafe to *Oxford*, and I am lodged at Mr. *Croſſe*'s, with deſign to be able to give you from experience an account, which is the warmeſt room; and indeed I am ſatisfied with neither of them, as to that point, becauſe the doors are placed ſo juſt by the chimnies, that if you have the benefit of the fire, you muſt venture having the inconvenience of the wind, which yet may be helped in either by a folding ſkreen, and then I think that, which looks into the garden, will be the more comfortable, though he have near hanged and intends to matt that you lay in before. You are here much deſired, and I could wiſh you here as ſoon as you can. For I think you would have both more liberty and more converſation, than where you are; and both theſe will be neceſſary, both to your health and your uſefulneſs; and as I am ſure I have abundantly ſhared in the latter from you, ſo I muſt profeſs to be very heartily concerned for the former, and muſt beg, that you would be ſo too, and let me ſee you are, by your care for its preſervation, which are the terms, upon which, for ought I ſee, you muſt have that bleſſing, and I am ſure you ought not to grudge yourſelf your cares, ſince by affording them there, you beſtow them too upon your friends, and upon me, I am ſure, in the moſt obliging way, who will not give any of that number, that pretend to that relation to you, the precedency in point of the affection belonging to it, though I muſt many, in point of the other qualifications. And alas! how evident is it, that we had need of better things than the beſt enjoyments of creatures to make us happy; when even friendſhip itſelf brings its ſenſible afflictions as well as refreſhments with it? The late experience I have had of this in our parting will not, I hope, be without inſtruction to me, as I am ſure it has not been without great evidence of the much obligation, that lies upon me in point of gratitude, as well of inclination, to be

Yours affectionately and conſtantly,

K. R.

I RECEIVED the favour of the books from you, by my ſiſter *Corke*, and I hope you will alſo give me leave to pay for them.

MY ſervice to dear *Broghill*, my ſiſter *Barrimore*, and ſiſter *Broghill*; and the ſame very affectionately to my dear lord preſident and his lady. I ſhall write to them all ſhortly, if it pleaſe God.

Lees, Auguſt 6, 1664-5.

I AM glad, my brother, to hear you go on to mend daily, in matter of your health, but ſorry to find you are not yet quite recovered to your former ſtate therein. If our reports do not ſpeak louder than truth gives them leave to do, God has again put a new hand of mercy upon this poor nation, to draw it to himſelf. But, for ought I hear, we are like to make our returns as diſingenuous towards him for this deliverance of the many preceding ones, that he has afforded us; which makes me fear, that even our bleſſings will prove bitterneſs to us in the end. I congratulate with you the happineſs God has given you in making the employments of your health ſuch, as you may ſeaſonably and comfortably review and continue in the times of your ſickneſs: the rarity of the mercy, that brings any one to that courſe of life, highly recommends it to your value and gratitude, for moſt people do ſo live, as to leave themſelves no better hope for their death beds, than that thereon they may by repentance undo all they have been doing in their way thither. Whether the dominion you are recommending to men will take ſo much with them, to raiſe their ambitions towards its attainment, as that they moſt commonly purſue with much more pains, I know not, and much doubt the worſt. But certainly it is moſt likely, the beſt way of man's ruling the creature is by his employing thoſe faculties to that purpoſe, which God himſelf has fitted in their employment to make him able to do ſo; and thoſe are his rational ones, whereby as he may diſcover the properties and uſes of other things, ſo he may chuſe to apply them thereby to their proper ends, the ſervice and inſtruction of mankind; but ſwords and guns are taken, upon the word of the great deſtroyer, to be more ſuitable means to that end, and uſed accordingly, though we daily ſee, that by that way of overcoming we ſpoil what we ſhould govern. Your naming *Oxford* to me as free from infection makes me fear you may have ſome thoughts of going thither; which if you have, I ſhall much more repent my not ſtaying with you, yet dare not perſuade againſt

againſt it, becauſe I aſſure my ſelf you are carried thither in purſuit of aims, that I would rather excite than obſtruct you in. But I earneſtly petition, if you have, that you would before you give me warning enough to make you a viſit, for I have now got a lodging at *Newington-Green*, which miſs's illneſs, which for two or three days has been pretty violent, though now turned into an ague at preſent, keeps from being uſed by

Yours affectionately,

K. R.

THE ladies here preſent you ſervices. My girls are your humble ſervants.

Lees, July 29, [1665.]

I HAD, my brother, rambled ſo far before I was aware into other matters, in my laſt to you, that I had not left my ſelf time or room to mention what I chiefly deſigned, and which I could not therefore endure to mention, *en paſſant*, my ſatisfaction in hearing you had near finiſhed your treatiſe of ſubſtantial forms, which will yet ſo much further explicate your notion of figures and texture, as to help the conſidering part of mankind to a clearer proſpect into this great frame of the viſible world, and therein of the power and wiſdom of its great Maker, than the rough draught, wherein it has hitherto been repreſented, in the ignorant and wholeſale philoſophy, that has ſo long, by the power of an implicit faith in the doctrine of *Ariſtotle* and the ſchools, gone current in the world, has ever been able to aſſiſt them towards; and I am not a little delighted to find, that your diſcourſe of the excellency of divinity will be finiſhed about the ſame time, ſince that will make it apparently come from one, who chuſes it not for the beſt, becauſe he knows little beſides, but from one, who from a general knowledge of other things has, upon deliberation, choſen to give that preheminence of them all, which may very probably invite men to conſider it ſeriouſly, who have, upon a preſumption of their other learning, eſteemed themſelves entitled to neglect or oppoſe that. Though you tell me not, who objected againſt your writing Occaſional Meditations, becauſe you have named me, who encourage you to write more of them, I dare venture to lay my credit with you, that you yourſelf do think your celebrater as competent a judge, in ſuch caſes, as your exceptions-maker. And I think the very objections, with the reaſons of it, are a ſtrong argument againſt itſelf; and ſhew it is made out of fear, that ſuch things written by a philoſopher may do that good in the world, that the objector (who I preſume pretends to be one himſelf, becauſe he would think, being ſo ſets a man above making a uſe of the creatures with reference to the glory of the Creator, or to beget ingenuous and grateful thoughts in the hearts of men towards him) would have done, and therefore decries it for its meanneſs, whilſt he dares not look at the light it breaks out with, leſt that ſhould make him out of love with himſelf. This makes me hope you will not give ſuch perſons as prevailing a power over your thoughts, as you did Sir *Peter* over your diſcourſe of the Scriptures, to cut them off from being publiſhed for the further good of thoſe, who own themſelves to be benefited by thoſe you have already publiſhed; but that, ſince you are not to be ſuſpected able to keep from making Occaſional Meditations upon a ſubject ſo plentifully affording you matter for them, as the great judgment now in this nation, and the effects it has already produced therein, you will not be ſo uncharitable, as to keep them to yourſelf, ſince the general fear, ſtruck by this plague into all ſorts of people, does ſurely prepare the hearts, wherein it lodges, with leſs reſiſtance to hear of a God, and the things of another life, than before that preparation they would have been apt to have heard them with; and ſince it may alſo well be ſuppoſed, that many, who find that fear diſquieting enough, ſtrive to free themſelves from that, by endeavouring againſt thinking at all, becauſe they know not how to begin ſo to think, as by thinking to get themſelves relieved from the torments their fears bring them, or thoſe everlaſting ones, which bring their fears upon them, upon the approach of that diſeaſe, that ſcatters death ſo plentifully round about them, which they know ſends into eternity. How obligingly then might you teach ſuch to help themſelves in ſo great a diſtreſs, by reading your reflections on the grounds of their fears, without finding therein any particular reproof addreſſed to themſelves, that might arm them with offence againſt all the good advice given thereupon; and in ſhewing them there, how thoſe, who are prepared for death, can entertain themſelves, upon the approaches of it, as rational and pious perſons, taking in as well comforts as cautions to themſelves, from both thoſe principles, upon the moſt mortal occaſions; and to find things indeed done, ſhocks all objections againſt attempting to do the ſame things, that can be raiſed upon the pretence of the impoſſibility of doing them; and the belief of a poſſibility of effecting things ſo conducive to mens preſent peace and eternal ſecurity, as to be rendered hurt-free (though not ſhot-free) from death-darts, muſt be a very ſtrong engagement to men, to ſet themſelves diligently and reſolutely to make that attainment their own. Now pray do not daub your own conſcience, for you will never ſtop my nor many more mouths with your allowable reaſons, known to yourſelf, and producible to no body elſe, againſt ſo ſeaſonable and aſſiſting a work of mercy; but take up your papers, and add theſe to the reſt you confeſs lay ready by you, when you publiſhed the laſt, and let us have the ſecond edition, to help the people to ſpend a faſt day devoutly and unweariedly. I ſend you here the receipt I promiſed you in my laſt,

laſt, of which I long for an anſwer, as to the inviting part (here we will help you to take up and tranſcribe.) Our palſy balſam does wonders here, and God does no leſs than wonderfully in preſerving all theſe parts hitherto from infection, though *Crip*'s jealouſy is very inſtrumentally active towards it. All the ladies, the counteſs, and my girls, are your ſervants, and I with great ſincerity and entireneſs

Yours, *K. R.*

Lees, September 9, [1665.]

I FIND, my brother, that though you be retired from *London*, you cannot be ſo from the viſits of your friends, nor from the diſtractions, that the kindneſs of them gives to the happier employments God has enabled you to dedicate yourſelf to. And though I be apt to think, that thoſe things, that would be eſteemed by others welcome diverſions, are to you interruptions uneaſy enough; yet I know not, whether they do not as much recommend more retired and ſerious entertainments to us, in general, by the variety they make us taſte, than they hinder us in the actual exerciſe of our thoughts about them, during the time we are forced to let them take us up; which ſeems to me a piece of the neceſſary penance of this life, that all muſt now and then undergo, to diſcharge the exactions of natural relations, and to continue the affections, with which they ought to be diſcharged. In your letter I met the only news I had heard this good while of my lord and lady *Clifford*, who, I preſume, took you in their way towards *Yorkſhire*, where the counteſs has already paid her ſiſter ducheſs a viſit of a whole week long, and from that went home full of the deſign of treating her and the Duke at her own houſe, from which you will not ſuſpect ſhe will too eaſily be diſturbed, by mortifying conſiderations, though, beſides the publick, and even general ones, which are very great, there is a ſmall particular one added, by poor *Charles Supple*'s being ſhot in the laſt ſea fight with a muſket bullet into the head; of which it is thought he will hardly recover. The *London* weekly bills do, I aſſure myſelf, give you the ſad news that place affords; which is extraordinary enough to be amazing to thoſe, who would but ſeriouſly reflect upon what was doing in that place, before we left it, and what has been ſuffered there ſince. Not that the former is not an apparent and juſt cauſe of the latter, but that that cauſe and effect both may confound us in the ſerious reflection upon them; but ſince you ſtill continue reſolute againſt publiſhing thoſe you make, I dare urge it no further. Eſpecially ſince you ſeem to decline that, in order to recommending things of more uſe, in order to religion, the intereſts whereof have been ſo long ſo much neglected, that they even ſeem to lie a bleeding now; and therefore to be now ſerviceable to them, will be a work, that will appear to carry ſuch a ſincerity in it, as God will not fail abundantly to recompenſe. And how delightful it muſt be to ſee you, whom I love ſo particularly, engaged in ſuch works, that lead to ſuch rewards, you may eaſily gueſs. I can juſt requite the news you ſend me of *Oxford*, with ſending you the like of this; which is yet, through the rich mercy of God (as is alſo my poor houſe at *London*, or at leaſt was three or four days ſince) preſerved clear from the ſpreading infection of this plague. But it is now more beſet with it, than it was when I writ laſt to you; the next town to *Chelmsford*, and one houſe at *Burntwood*, having had ſome in them dead of it, by the coming of perſons thither from other infected places. But few places have it no nearer them than this yet has. The road from *Epping* to *Blechington* my lady *Angleſey* will be able to teach you; for ſhe went it herſelf, and will, I dare ſay, heartily allow you to lodge at her houſe of *Park-Hall*, which is but a mile or two from *Epping*, and from thence hither is about eighteen miles. For my lord of *Warwick*, I can aſſure you, as he does me, that he is not only not afraid, but deſirous of your company here; and he adviſes your lying at *Kimbolton*, my lord chamberlain's houſe, a day's journey from *Oxford*; and from thence at *Audley-end*, another day's journey; and thence hither, but to Mr. *Waller*'s; which I hope is uninfected, and in whoſe houſe I dare ſay you may lie, and be welcome, near *Beaconſfield*, and thence to *Park-Hall*, which is alſo clear, for ought I know, and thence hither, is your neareſt way; and *Crip* would ſend a man to guide you, when you come towards theſe parts, if we might know when you would do ſo; but one of theſe two ways will eaſily be found, and both, I hope, are ſafe. You will be heartily welcome, and very quiet here, and I am ſure give much ſatisfaction to ſeveral, though moſt to me; and it will be to your good nature ſome, to give ſo much; and therefore, in hope of that happineſs, with the ſervices of all here preſented to your honour, I ſhall conclude myſelf

Yours.

IF you make not haſte, the court will overtake you at *Oxford*.

Nov. 14, [1665.]

AS well for juſtice and experience ſake, my brother, as for my own eaſe, I do rather believe, that it is my own misfortune, than your unkindneſs, that has kept me from receiving one line from you ſince that you wrote me by Sir *William Lemans*, though even ſo conſidered, it has afforded me ſome unpleaſant doubts concerning you, which have been increaſed by the memory of the promiſe you ſent me of letting me know, how I might ſend to and hear from you before you left *Oxford*; which whether or no you have yet done, I am ignorant of, and the ſuſpence, that ignorance keeps me in, in reſpect of your

health,

health, muſt be rendered the more uneaſy, by the great mortality now ſtirring in this poor nation. I have not therefore ſat ſtill under this unſatisfaction, but have twice or thrice wrote to you, by the way of *London*, not having had any opportunity in that time to ſend to you more directly from hence, till now Mr. *Jeſſop*'s going to *Oxford* gives me this; where if he meet you, he will be able to tell you, with how extraordinary a mercy he has preſerved this family all this while, not only from that, which, by way of miſerable excellency, is called the ſickneſs, but from all other diſeaſes, *Crip* only excepted, who had lately a roaring fit of the gout, but a very ſhort one, in reſpect of thoſe he uſed to have at this time of the year, which he attributes much to his chewing of ſcurvy-graſs; of the benefit of which I have received another teſtimony from one, whom I adviſed to uſe it. To repair to myſelf, your abſence, as much as I can, next my ſubmitting to the will of the all-wiſe Diſpoſer, who is pleaſed ſo to caſt us, I entertain myſelf with your books, which yet, by the very few ſtudious perſons I meet here, are, as faſt as I can ſuffer them to be, begged or borrowed from me, who lend them willingly, upon the ſame account I ſpare you patiently, the hope, that both they and you will do more good abroad, than by being ſtill with me; and I ſhall ere long have read them all over, as well thoſe I had read before, as the laſt; and then my fingers will be itching, to look into the ſealed roll of papers, written upon, "About religious matters;" and I would fain open them, with your leave, which I hope my being ſo ingenious a coxcomb as not to do without aſking it, will rather bribe you to give, than deny me. But if it ſhould not, I know not what I may be tempted to; and you know I am of a ſex, that has long been allowed for an excuſe of the frailties of thoſe, who are of it; and, conſidering how much you believe of thoſe, I muſt not fear, but you will conſider them as tenderly as they require to be conſidered, and then you will not ſtick to afford me ſuch a pardon. I am very much pleaſed with the aſſurance my experience of God's goodneſs to you gives me, of your neither being idle, nor ill employed; nor only for your own good; but I ſhould be much more pleaſed, in having a ſhare in what you are about, that exceeds not my capacity of underſtanding; and if you would let me receive ſome ſuch preſent by the return of this bearer, you would do me a great favour, and give me a profitable employment; for all perſons great and fair are not company, nor can give entertainment, that reaches beyond our ſenſes in its pleaſingneſs. *Frank* is, I bleſs God, freed from her ſpitting, but afflicted with her head-ach more than uſual; to which her not ſleeping well, and her want of tea, contributes very much. If *Leeſhe* be with you, pray preſent him my humble ſervice, and my petition for ſome for her, who and her ſiſter are your humble ſervants, and I with great affection and reality,

Yours, *K. R.*

Sept. 12, [1666.]

IT having, my brother, pleaſed God, ſtill to continue us in the ſafety you left us; I have ſince taken to myſelf the mortification of ſeeing the deſolations, that God, in his juſt and dreadful judgment, has made in the poor city, which is thereby now turned indeed into a ruinous heap, and gave me the moſt amazing ſpectacle, that ever I beheld in my progreſs about and into this ruin. I diſpenſed your charity amongſt ſome poor families and perſons, that I found yet in the fields unhouſed. Since then, Mr. *Worſley* has been with me, and given me very conſiderable particulars of providence, that aſſiſted to his preſervation, and that of his goods, which he probably enough thinks raiſed in value, as to that part of them, wherein you have an intereſt, by the great conſumption, that has been of that ſort of commodity, both at *Sion* college, and alſo in St. *Faith*'s church, where all thereof was deſtroyed. He very ingenuouſly told me, he now deſired to perfect to you that bill of ſale for them, that he at firſt promiſed to give you, not ſeeing, how your title to them can otherwiſe be legally good and ſure; and he propoſes then their being in your name put into Dr. *Sydenham*'s hand, as his ſecurity for 250 *l.* for ſix months; which, if you have no exceptions to, will fall in well for my occaſions, one of the moſt preſſing of which is the paying of 100 *l.* to the doctor, which I owe him, and for which your bond was given, by way of collateral ſecurity, to confirm the engagement of this houſe to him therefore, ſo as he need lay out but 150 *l.* and pay himſelf 100 *l.* upon a ſecurity worth 5 or 600 *l.* and that but for ſix months. But if you have any exception to this, uſe the like liberty in rejecting it, that I take in propoſing it; or elſe you will forbid me that ſort of proceeding with you for ever: and, poſſibly, ſome, where you are, might willingly deal for ſuch a treaſure as thoſe things are by this ſad accident made to be now; if not, I forget not what you were pleaſed to offer before you went hence. I am to add to you, from Mr. *W.* that juſt before this fire, he had from the *Barbadoes* received ſome of the ſenna ripe and cured, with an aſſurance, that his correſpondent there had ſaved enough of the ſeed to ſow half an acre with it; and had taken ground to that end: that he is now going to make the trial of it by himſelf, having begun to do ſo by an apothecary, and as ſoon as he has done ſo, intends to preſent his majeſty with ſome of it, to have it tried by Dr. *Cox*, or who elſe he ſhall pitch upon, and then to proceed to take out his patent for his privilege, which he looks upon as like to be too conſiderable to be long enjoyed alone by him, without envy; to avoid which, he did offer to join our friend and his at court, as patentee with him therein. But you know what he aſſured us together of his inability to advance the 500 *l.* expected by Mr. *W.* from him for his admittance into that privilege, and there-

fore he deſired me to offer you the putting in of any ingenious friend of your's, who may be fit to countenance the thing, and apprehenſive enough of its value, to look upon his being made ſharer therein for 500 *l.* as a kindneſs done him; and upon your ſcore he ſhall be admitted. To theſe two things he would gladly receive your anſwer with as little delay as you can give it; as I do deſire at the ſame rate to hear how you got to *Oxford*, and how you enjoy your health there. All our news here are the ſad ſtories of undone people, and of thoſe we have great abundance, but ſcarcity enough of pity towards them, whoſe wants will increaſe, as the charity of thoſe, that now relieve them, will tire; to prevent both which ills, ſome think, the moſt rational way were, to make a city of huts, till one may again be made of houſes, and in them to let the poorer ſort of tradeſmen and labourers be ſet a-work and trafficking, and that ſo by employment and getting ſomething, they may be kept from being idle and at leiſure to find out and hatch cauſes of diſcontent and diſorder. But as yet, no ſuch thing goes about, which makes thoſe, who conſider, fear we ſhall feel more of this ruin, when the undone people feel more of their want, than in their preſent aſtoniſhment they are ſenſible of. We are, God be praiſed, reaſonable well as to health in this ſmall family, only *Thomas*'s not having been ſo for two or three days, has hindered him from going abroad in order to obeying your commands. *Greſham* college is now *Guild-hall*, and the *Exchange* and all. If the philoſophers and the citizens become one corporation, henceforward, it may be hoped our affairs may be better managed, than they have been, unleſs the citizens ſhould prove the prevailing party, which, as the worſt, it is moſt like to do in this world, according to the ſmall obſervation of

Your's *K. R.*

Sept. 18, [1666.]

THOUGH I had not, my brother, received your firſt letter, and the bag of lime, when I firſt writ to you, they have both come ſafe ſince to my hands; for which I preſent you my humble thanks, and repeat them for the repeated favour of your other of the 15th inſtant, which I laſt night received, and therein the aſſurance of your acquieſcing in the propoſal, wherein Dr. *Sydenham* was mentioned, with which I this day acquainted him, who propoſed it to me (who came to me freſh from his majeſty, to whom he had preſented a parcel of his already tried ſenna, to be further tried by his majeſty's command, who received it not only pleaſedly, but greedily, and much complimented its preſenter) who, upon advice, thought the beſt way to put it into ſpeedy practice, would be your making him the propoſition in a few lines from yourſelf, Mr. *W.* not being enough a man in his favour, to make it grateful; and I being ſo much fallen from it (why, I no more know, than I did how I came into it) that he has not ſince my return home, nor for a good while before, made me ſo much as a civil viſit, and you being a perſon, for whom he has much reverence, and not the leſs becauſe you have an eſtate in land viſible to him, and who may properly enough offer the ſtriking off the 100 *l.* I owe him, becauſe you were pleaſed by your own bond to engage for it. This, if you can ſatisfiedly do, you may if you pleaſe tell him. I ſhall direct him to the place, where the books are; and I ſhall either deliver him your letter myſelf, or make *Thomas* do ſo, which of the two you ſhall direct: but if you ſcruple this at all, be pleaſed to ſay ſo; and I will in your name propound it to him. I may ſuddenly be able to give you a particular account of the courſe Mr. *W.* thinks of taking to make his ſenna preſently a commodity, and to multiply it to great quantities; which appears to me neither diſingenuous, nor unpolitick. My brother *Burlington* intended not to begin his journey towards *Dublin* (which he will viſit in his way into *England*) till as yeſterday, which freed me from the fears for him, that laſt night's extraordinary ſtormineſs might reaſonably have given me, if I had had cauſe to ſuſpect he had been then at ſea. Our fleet is ſuppoſed to have been ſo, and fifty ſail of the *French*, with the duke of *Beaufort*, were very lately ſeen from the *Iſle of Wight* upon our coaſt. This day the parliament met, but ſo thinly, that his majeſty ſtayed going thither, till the houſes might be better filled to receive him. To this day God is pleaſed to continue the wonder, of not ſuffering any act of rudeneſs or violence to be done by any of thoſe numerous ruined people by the late fire, to thoſe, that were preſerved from the judgment, that ſo deſtructively fell upon them; though their numbers be ſtill increaſing, by the pulling down work, that is ſtill proceeded in about the Turrets and *Tower-Hill*, whereby above one thouſand of thoſe, that the fire left in their houſes, are turned out of them. Sir *John Langham* has generouſly given five hundred pounds a year to the poor of the burnt pariſhes, to be continued to them, during his life, from that family, by Dr. *Cox*, and another friend is yet ſent to

Your *K. R.*

My girls are your humble ſervants. I preſented your ſervice to my ſiſter *Burlington.*

November 13, [1666.]

IT is no ſtrange, though it be often an uneaſy thing, my brother, to meet with diſappointments in what we moſt deſire, or apprehend ourſelves moſt ſecure of, in this world; and therefore I was not unwarned, that ſuch a matter might be encountered in the

the buſineſs of your coming up, which yet I am glad is not delayed by any indiſpoſition you find in yourſelf, and which I therefore hope you will ſuffer to be delayed no longer, than your neceſſary occaſions oblige you to. By the ruin of *Paul*'s there is made a melancholy diſcovery of a dead body, buried, it ſeems, in a vault between that great church and St. *Faith*'s, that was under it; which vault being broken by the fall of a huge weight of ſtones thrown down by the fire, there appears a man of a light brown hair upon his head and beard, in his full and entire ſhape, except, where his chap is a little broken by ſome of the ſtones that fell, and by that breach his tongue is made viſible within his mouth, but ſhrivelled up; his fleſh dried upon, but not conſumed from off his bones; he ſtands upright upon his tip-toe, only his head leans a little on one ſide againſt the wall. By an inſcription upon his breaſt he is found to have been *Thomas*, biſhop of *London*, chancellor, and buried in the year 1402. He was not embalmed, nor is any ſear-cloth to be found about him; but upon the ſkin of his arms ſome bits of thread, which are apprehended to have been that uſed in ſewing up his ſhroud, which makes his ſo entire preſervation for now two hundred and ſixty four years very remarkable. The ground there, they ſay, is chaulky (that is I preſume lime-ſtony) which it is yet aſcribed to. To what you are pleaſed to enquire about the papiſts, my ſmall intelligence capacitates me to return you but this anſwer, that the apprehenſion, that you know ran ſo currently amongſt the people, whilſt the fire laſted in the city, of its being inkindled with deſign by the French and Dutch, having received a confirmation by the confeſſion of a Frenchman of that religion, who conſtantly affirmed, himſelf and another man of his own country and opinion to have been, by fire balls, the burners of the firſt houſe, that proved the train to fire the reſt of the city; and he being upon that confeſſion of his often repeated, and, (to the confutation of what was ſaid of his being mad) he having, in the midſt of all the ruins, brought his keeper to the very place, where that baker's houſe ſtood, and affirmed he there threw the balls with his comrade, and ſaw them burn down the houſe, when his fellow went preſently for *France*, and he into *Eſſex*, (where he was taken and brought up) executed at *Tyburn*. And this being now ſo good a record, that thereupon (I am told) all the judges have given their opinions, that no tenant in the city is bound to be accountable to his landlord for what was burned, becauſe the fire was kindled by a foreign and proclaimed enemy, againſt whom it was not in the landlord's power to give them protection. This, I ſay, has revived to the memory of the people the principles and former practices of thoſe of that religion, and raiſed a fear in them of their being now deſigning farther miſchiefs, that may reach their lives, by a maſſacre; which fears have run like wild-fire through the whole nation, and cauſed a loud cry, of the papiſts having the greateſt part of the arms in their hands; on which the Houſe of Commons paſſed ſome votes to have all the laws in force executed upon them, and in particular, to have all ſent out of his majeſty's guards, and diſarmed, that were of that religion, and ſhould not prove their not being ſo, by taking the laws of allegiance and ſupremacy, and receiving the ſacrament according to the church of *England*. Theſe votes being concurred in by the lords, and by both preſented to his majeſty, he has, purſuant thereto, publiſhed the incloſed. I muſt haſte, leſt I looſe ſending. I cannot aſſure you, but I doubt our fatal bill has this day paſſed the lords; but I am ſure I am

Yours affectionately.

I HAVE ordered *Thomas* to look out for charcoal, and ſhould gladly receive your order to put my back-houſe in poſture to be employed by you, againſt your coming, that you might loſe no time after.

My girls are your ſervants.

September 11, [1677.]

I CANNOT, my brother, but condole with you the remove of our true, honeſt, and ingenious friends in their ſeveral ways, Dr. *Worſley* and Mr. *Oldenburg*, ſince it has pleaſed God to call them hence ſo ſoon one after another. Yet I am not without my fears, that my mentioning of them may revive to your good nature the ſorrow, that I aſſure my ſelf you received the news of their deaths with. But my experience (though I put but an ill compliment upon you in meaſuring you by myſelf) has taught me, that it is ſafer to have thoſe uneaſy things to us ſo far touched upon, as to beget ſome vent for ſuch ſorrows, rather than by ſmothering them within ourſelves to continue to us a longer exerciſe under them. They each of them in their way diligently ſerved their generation, and were friends to us. They have left no blot upon their memories (unleſs their not having died rich may go for one) and I hope they have carried conſciences of uprightneſs with them, and have made their great change to their everlaſting advantage; and if they be poſſeſſed of what we do but hope for, and what we ſhould preſs after, we need not lament for them: and for ourſelves, ſuch loſſes, by the bleſſing of God, are made to aſſiſt us in the work he calls us to, of getting ourſelves weaned from this world, out of which if the few pious and ingenious perſons, that make it tolerable, were once taken, what would be left in it but rattles, and fools to play and make a noiſe with them, or inſtruments of cruelty, and knaves to uſe them in doing miſchief. Therefore let me beg you to baniſh melancholy thoughts upon theſe ſad occaſions, and inſtead of recommending ſerious ones to you, let me beg you to enjoy the bleſſing God has beſtowed upon you, in an ability of knowing how to entertain your-

ſelf,

ſelf, and converſe with him in the abſence of all other company; and in ſo doing to find that, which may not only render that abſence tolerable, but welcome. I am loth to conclude after that, with threatning you with my return to you: but the hopes of it may well at the end of a condoling letter be brought in as a conſolation to her, that is

Your own affectionately.

THE counteſs and our youths are your ſervants.

September 14.

BROTHER,

SINCE your going into *Ireland*, I received to this day but two letters from you, and thoſe at one time, written upon your firſt arrival, by means whereof I am kept in a conſtant ſuſpence and uncertainty concerning one of my neareſt intereſts in this world, which is that of your health. But alas! I might be ſo, though I heard as frequently from you as I could hope or wiſh; and indeed there is but one ſatisfying certainty, and that is, that nothing comes to paſs but by the will of our heavenly father, nor nothing to paſs by that will, which is not beſt in its ſelf, and beſt to them, whom he hath dignified by making them his not only by creation, but by union through Chriſt.

THE laſt fortnight I have been ſomething more than ordinarily exerciſed in thoſe accidents, that teach me experimentally to confeſs that ſentence, which *Solomon* pronounced of vanity and vexation upon all things under the ſun, to be extremely true. This day fortnight I had a whole committee to my breakfaſt, who were pleaſed in civility and kindneſs (as they ſaid to me) to call me in, and give me the thoughts they had had of my little affairs, and to hear from me my own thoughts upon theirs, and upon the ſame ſubject. But they, like lawgivers indeed, were to command, and not reaſon; and by exerciſing their legiſlative power, gave the affair the concluſion I formerly told you; which though it was very ſmall in point of receipt, it was not altogether inconſiderable in point of reſtoring and ſecuring, and very welcome to me, as it advanced far towards my freedom from an attendance, that both my body and conſcience were weary of; and in that I began as ſoon as they diſmiſſed me, to delight myſelf. But to chace me out of that fool's paradiſe, that very evening I received a letter from *Charles Rich*, telling me of my ſiſter's being ſtrangely and extremely ill, and inviting me very earneſtly upon that occaſion to *Lees*, which though in relation to my own affairs it was very inconvenient to me to hearken to, in relation to my kindneſs to her, and the diſcharge of my conſcience in ſerviceableneſs towards her in a time of ſuch diſtreſs, (wherein commonly the company of a poor puritan or ſectary is more acceptable, than that of the moſt pleaſant and quick drolls in the world) I could not refuſe it, but went the next morning. And when I came thither, found her a ſad ſpectacle indeed, her diſeaſe lying more in ſtupidneſs than pain, and in her underſtanding and ſpeech (which were both very imperfect,) than in the more remote parts of her body. She was no more joyed to ſee me, though they about her endeared my viſit to her, by telling her, how I had neglected all my own concerns to come, than if ſhe had had as little, as ſhe uſed to have much kindneſs for me, when ſhe was herſelf. This, you will eaſily believe, was a mortifying encounter to me, to ſee her well enough to be out of her bed, and to retain the wonted fulneſs and almoſt colour her face had in health, and not to have any ſettled working of reaſon or plain expreſſion in ſpeech; to ſee the carcaſe of a friend there, and her ſoul gone as to any rational uſe ſhe had of it; and her kindneſs to me as dead, as her reaſonings to herſelf, or her thoughts towards God, for ought I could ſee were alſo. I ſtayed there till Saturday, and then by the doctors and all conſents, brought her away with me: her ſpeech in that time would ſometimes be more diſtinct, and but ſometimes; and at that ſame rate ſhe reaſoned very unfixed and unſettledly, and her head began to ſhake, and ſhe to have a ſenſe of a heavineſs in it, which confirmed the doctor's opinion of its being a ſpice of the palſy: but the doctor here thinks its root to be in the mother, yet confeſſes the cauſe of her ill to be very inward and hidden in his opinion, and therefore I doubt muſt go blindfold towards her cure, which yet advances but very little, if at all. Here I ſaw the vanity of the thoughts I had taken up of ſtaying quietly at home, becauſe this condition of hers made me judge my attendance upon her very neceſſary (though ſeriouſly my lord and lady *Warwick* and *Charles Rich* are very obligingly careful of and kind to her.) But on Monday after I had viſited her, at my return home I found my poor *Frank* fallen very ill: her diſtemper was ſtrongly feveriſh, and increaſed to ſuch a violence in the two following days, that ſhe loſt both her ſenſe and ſpeech, and retained ſtrength enough only to diſorder and endanger herſelf. The manner of her ſickneſs gave me no ſmall apprehenſions of its being the plague; and to increaſe thoſe, an old woman, that then did and formerly had tended her, ſaid there was a riſing about one of her thighs. But God was pleaſed to give me ſo much courage upon that information, as to reſolve not to truſt the old woman's fumbling feeling, but to try myſelf, which I did, and found clearly, that ſhe was miſtaken in that particular, though ſtill ſhe appeared no leſs mortally ſick, than if it had been, that that night I watched with her in expectation that it ſhould be the laſt ſhe would live; but it pleaſed God to carry her through it, and to reſtore her ſenſe and ſpeech in the morning, when alſo the ſmall-pox broke forth, and appeared then a deliverance to me; but now they are upon

her a diſeaſe, and a moſt loathſom one, though God be pleaſed to preſerve me from the fear of them, and to make me able and willing to be with her, who has a face, that ſhews what ſtuff theſe bodies of ours incloſe, and how little all the neatneſs of art can prevail againſt its own filthineſs, when God gives it a commiſſion to break out; and how little cauſe we have to make that the object of our pride, that is filled with ſo many leſſons of humiliation. My attendance upon her makes me know nothing of my ſiſter's condition but by report, and that makes it much the ſame. In this time poor *Fenton Parſons* is dead of a fever, after it was turned into an intermitting ague, as it is thought through being let blood unſeaſonably by one, that is called a doctor; but ſure their trade is rather to cure men of their bodies, than to cure men's bodies of diſeaſes. He was an honeſt friendly man, and of as great hopes for the things of this world, as any one of his age and profeſſion; but one ſuch blow lays all thoſe hopes in the duſt with us, and leaves us miſerable, if we had not ſurer and better grounded ones, which are turned into abiding poſſeſſions, when the former periſh. Thus you have a long account of my laſt fortnight's changes; and yet you muſt not be rid of me, till I have been faithful to you, in telling you, that there is not only in this place, but in this country, ſo general a viſitation of ſickneſs, which are for the moſt part fevers, fluxes, and ſmall-pox, that there is hardly any family free from one or other of them, ſo as into this danger you muſt come, if you come hither; which if you be free from where you are, I do heartily give up your company to your ſafety, and to that you ought to give up all little ſatisfactions, that cannot be taken without it. As this ſcourge is upon us, ſo are our neighbours of *Holland* of a piece with us in this, though we be little enough one in other matters. For about *Amſterdam*, *Morian* writes, that they have ſcarce enough healthy people left to milk their cows. And out of *Germany* from a very good hand honeſt *Hartlib* has received aſſurance, that their very waters are turned into blood. Out of our Northern parts colonel *George Fennick*, an honeſt and diſcreet man, writes, that he ſaw lately a cloud very black, and about the bigneſs of an acre of ground, in the midſt whereof there was a perfect rainbow for matter of form, but for colour only a pure blue. At each end of this bow appeared men in arms, with all their warlike equipage, who did ſeveral times charge one another and with various ſucceſs, till at length, as I take it, the party at the Eaſt end the bow beat the other quite away. Theſe being ſet for ſigns and for ſeaſons, do hereby ſignify ſomething; though I think he, that would dare to affirm in particular what, might be as like to miſtake as hit right: but we have a ſure word, that tells us, all this old frame of heaven and earth muſt paſs, and a new one be ſet up in its place, and then your expectation of ſeven years will be abundantly anſwered and exceeded; but whether it will come within the ſeven years, I dare no more ſay than I do know; only this methinks I am ſure of, that it is a brave thing to be one of thoſe, that ſhall lift up their heads with joy in expectation of a preſent redemption, when all theſe ruins and confuſions, ſhall be upon the earth; and ſuch brave men and women are only true Chriſtians. Therefore, my dear brother, let us endeavour for that dignity, though in maintaining it we take courſes, that have the contempt of the world heaped upon them; for to be contemned by the contemptible is glorious in the opinion of your

K. R.

IN excuſe for my not writing by my brother *Frank*, I muſt tell you, he never told me of his going, nor heard I till he was gone. My ſervice to him, if he be with you.

THIS is only, my brother, to tell you, that it pleaſed God to carry me through my journey much better, than I could reaſonably have expected I could have paſſed it, conſidering my preparation for it was a night full of ſmart pains, and almoſt without ſleep; and that when I went into the coach, I was ill enough to have been more properly put to bed. Here we have a right proſpect of what the world calls greatneſs, croud, noiſe, heaps of meat, and drink in proportion, contrivance and pains to pleaſe the ſenſe; vexation and fear, and in concluſion emptineſs and diſappointment. You are now very near the hour, wherein your miſtreſs is, by giving herſelf to another, to ſet you at liberty from all the appearances you have put on of being a lover; which though they coſt you ſome pains and uſe of art, were eaſier, becauſe they were but appearances. It is well, if ſhe put not herſelf by that act of bounty into more ſlavery than ſhe gives you liberty; but now ſhe muſt perfect making the venture ſhe has ſo far proceeded in. I muſt, before I free you, recommend your health to your care, as the only obligation to be put by you upon me, greater than thoſe, that you have already heaped upon

Yours affectionately,

K. R.

Letters from Mr. John Locke *to Mr.* Robert Boyle.

Cleve, Dec. $\frac{12}{22}$, 1665.

Honoured Sir,

I LOOK upon it as the greateſt misfortune of my journey hither, that it hath afforded me ſo little worth your notice; and that after having gone ſo far, and ſtaid ſo long, I ſhould yet ſend you ſo empty a letter. But, Sir, it is not unuſual, that a man far in debt, after long delays, ſhould pay nothing. And had I travelled through more fruitful places, and been myſelf better able to obſerve, I

ſhould ſtill have been in the ſame condition, and not have been able to return any thing of what I owe to your many and great favours. We are here in a place very little conſiderable for any thing but its antiquity, which to me ſeems neither to commend things nor opinions; and I ſhould ſcarce prefer an old ruinous and incommodious houſe to a new and more convenient, though *Julius Cæſar* built it, as they ſay he did this the Elector dwells in, which opinion the ſituation, juſt on the edge of a precipice, and the oldneſs of the building ſeems to favour. The town is little, and not very ſtrong or handſom; the buildings and ſtreets irregular; nor is there a greater uniformity in their religion, three profeſſions being publickly allowed: the Calviniſts are more than the Lutherans, and the Catholicks more than both (but no papiſt bears any office) beſides ſome few Anabaptiſts, who are not publickly tolerated. But yet this diſtance in their churches gets not into their houſes. They quietly permit one another to chooſe their way to heaven; for I cannot obſerve any quarrels or animoſities amongſt them upon the account of religion. This good correſpondence is owing partly to the power of the magiſtrate, and partly to the prudence and good nature of the people, who (as I find by enquiry) entertain different opinions, without any ſecret hatred or rancour. I have not yet heard of any perſon here eminently learned. There is one Dr. *Scardius*, who, I am told, is not altogether a ſtranger to chemiſtry. I intend to viſit him as ſoon as I can get an handſom opportunity. The reſt of their phyſicians go the old road, I am told, and alſo eaſily gueſs by their apothecary's ſhops, which are unacquainted with chemical remedies. This, I ſuppoſe, makes this town ſo ill furniſhed with books of that kind, there being few here curious enough to enquire after chemiſtry or experimental learning. And as I once heard you ſay, I find it true here, as well as in other places, that the great cry is ends of gold and ſilver. A catalogue of thoſe books I have met with, ſome at *Antwerp*, and ſome in this town, I here incloſed ſend you, and am told by the only bookſeller of this place, that he expects others daily from *Francfort*. The weather is here exceedingly mild, and I have not ſeen any froſt or ſnow ſince my coming; but it is an unuſual clemency of the air, and the heavens ſeem to cheriſh the heat men are in to deſtroy one another. I ſuppoſe it no news to tell you, that the Dutch have forced a ſurrender of *Lochem*; there marched out of it two hundred and fifty of the biſhop's men. In another rencounter the biſhop's men killed and took four hundred Dutch horſe: ſo that this has only ſhaked the ſcales, not much inclined them to either ſide. The States of *Cleve* and *March* are met here to raiſe money for the Elector, and he with that intends to raiſe men, but as yet declares for neither ſide: whether he be willing, or will be able to keep that neutrality I doubt, ſince methinks war too is now become infectious, and ſpreads itſelf like a contagion, and I fear threatens a great mortality the next ſummer. The plague has been very hot at *Cologne*; there have died there within this quarter of a year above eight thouſand. A gentleman, that paſſed by that town laſt week, told me, that the week before there died there three hundred and forty eight. I know theſe little trivial things are as far diſtant from what I ought to ſend you, as I am from *England*: for this I do not only blame my own preſent poverty, but deſpair of the future, ſince your great riches in all manner of knowledge forbid me the hopes of ever preſenting you with any thing new or unknown. I ſhould not therefore take the boldneſs thus to importune you, did I not know, that there is nothing ſo ſlight or barren, which you cannot force to yield you ſomething, and make an advantageous uſe of poor common things, which others throw away. This is that, which gives me the confidence to tell you, that I am,

SIR,

your moſt obedient, and

moſt faithful ſervant,

JOHN LOCKE.

SINCE I writ this I met with a Jeſuit, who had been in *Hungary*. I enquired, whether he had ſeen the mines; he told me, that he had gone down into a copper mine near *Neiſol* (if I miſtake not the name) ſix hundred fathom deep; that at the bottom in a hollow of ſome bigneſs, there dropped down water, which they received in a wooden trough, wherein they caſt pieces of old iron, which by the water would be turned into good copper. That a piece of iron of the bigneſs of a man's finger would be changed in three months, and that the mutation began from the ſuperficies inwards with ſtreaks (or to uſe his word *ſtriatum*;) that he had a horſe-ſhoe, whoſe exterior part was copper, and inſide iron. I aſked him, whether it were cold or hot, he told me it was warm enough, ſo that the workmen were naked from the waiſt upward, and ſweat in working. I had not time to enquire after more particulars, being haſtily called away. He belongs to the baron *de Goes*, envoy here from the Emperor. If you think this relation worth any further enquiry, or that I can any other way ſerve you here, I ſhould be glad to receive your commands, which either Mr. *Godolphin* or Mr. *Proctor Thomas* will convey to me.

Kercheri Mundus Subterraneus, fol. 1665.
Schotti Schola Steganographica, 4to. 1665.
Pet. Mich. de Hevedia Opera Medica, fol. 1665.
Heldebrandi Magia Naturalis, 4to. 1664.
Bauſchus Schediaſmata curioſa de lapide hæmatite & ætite, 8vo. 1665.
Strauſius Conatus Anatomicus, 4to. Gieſæ, 1666.
Licetus de Monſtris, 4to. Amſtelodami, 1665.

Simon

Simon Pauli de abuſu Tabaci & Theè, 4to. Argentor, 1665.

Phil. Jac. Sachs Gammarographia, 8vo. 1665.

Phil. Grulingii Medicina practica, 4to. Northuſa, 1665.

Ger. Blaſii Medicina Univerſalis, 4to. 1665.

Schookius de Sternutatione, 12mo. 1664.

Deuſingius de Generatione & Nutritione, 12mo. 1665.

Chriſt Church, Feb. 24, 1666.

Honoured Sir,

ACCORDING to the directions you gave in your laſt letter to Mr. *Thomas*, I have endeavoured to provide paronychia, and I think I ſhall be able to procure pretty good ſtore of it. The fitteſt time I ſuppoſe to gather it will be, when it begins to be in flower, which will be about a fortnight hence, the ſpring hereabouts not being over forward. How I ſhall diſpoſe or order it for you, I muſt deſire to be directed. Though by your approving of that way in other like caſes, I have ſome thoughts to pound and ſeal up ſome part of it in a bolt head, and ſo keep it, ſince the juice being the thing deſired; and not being fully acquainted with the way *Helmont* mentions he made uſe of to preſerve juices, I know not how otherwiſe well to keep it. In the proceſs of ♌ ☉ with ♈ you did me the honour to ſend me, I muſt beg this additional favour, to know, whether in each diſtillation I muſt draw off the ♈ of ad ficcitatem; for I find, that if the fire be a little augmented, the volatile ♈ being pretty well firſt gone over, the remaining liquor will riſe in plentiful very white fumes; but I ſuſpect this too violent a way of proceeding. After having diſtilled it in this manner, I let it ſtand above twenty four hours to cool; and though when I took off the head from the body, it had been ſeveral hours quite cold, and my noſe were not within a foot of the mouth of the body; yet there came out ſo quick and penetrating a ſteam, that it made me cry out, and made my eyes run over, but the effects of it quickly ended, and I was ſoon at eaſe again; though I dare be confident it is one of the briſkeſt and moſt pungent ſteams in nature. Did I not know, how favourably you interpret any poor eſſays, and ſlight obſervations of thoſe, that are willing to learn, I ſhould not venture to importune you with ſuch trifles. But ſince my deſign is not (nor can ever be) to inſtruct you, you will permit me by all the ways I can, to aſſure you that I am,

Honoured Sir,

your moſt humble, and

moſt obliged ſervant,

JOHN LOCKE.

Mr. *Thomas* preſents his humble ſervice to you. He and I are now upon a new ſort of chemiſtry, *i. e.* extracting money out of the ſcholars pockets; and if we can do that, you need not fear but in time we ſhall have the lapis; for he that can get gold and ſilver out of ſcholars, cannot doubt to extract it any where elſe. The truth is, he and I are preferred to be acceſſors of the poll-money; and if you do not make haſte hither, I believe you will at your next coming hither find us both beaten out of town, for having had too good thoughts of our neighbours, it being now an injury to believe any one rich, or a gentleman. We return our thanks for your queries by Dr. *Lower*, and intend ſome trials on the firſt opportunity.

Chriſt Church, March 24, $\frac{66}{67}$.

Honoured SIR,

I SHOULD not have been ſo ſlow in returning my thanks for the great favours of your letter, had not the careleſſneſs of the letter-carrier kept it from me two or three days after it came to town. I am concerned that you ſhould believe this truth, and I ſhould be very much aſhamed to appear guilty of tardineſs, to a perſon, who thinks his favours need an apology, if they are not as ſpeedy as they are great, who is not content to oblige an undeſerving ſcholar beyond the ordinary rules of kindneſs, unleſs he alſo excuſe the exceſs of his obligations. Had I any ſkill in the art of ſpeaking, I ſhould on this occaſion tell you, that this is to be like the ſun, and thoſe other heavenly bodies, who are exempt from the corruption and nigardlineſs of things here amongſt us, and beſtow their light and influence conſtantly, and as it were out of neceſſity. But, Sir, the pretenſions I make to philoſophy will excuſe my want of rhetorick; and though I have but little of the knowledge, yet I ſhall make uſe of the language of a philoſopher, and content myſelf to ſpeak plainly, as I mean honeſtly; and do therefore with a ſincerity due to that profeſſion, tell you, that I have a very great ſenſe and acknowledgment of your favours, however I want words to expreſs it. The warts you ſpeak of, I doubt not but I ſhall be able to provide you in the place I am going to, though I would be glad to know, whether there hath been any difference obſerved in the operation of thoſe of ſtone-horſes, geldings, and mares, and whether they are to be taken from live horſes, ſince (if I forget not) *Helmont* ſome where ſays, that if in hiſterical fits, (for in that diſeaſe he commends them) you uſe thoſe that are taken from an horſe, *æſtuante venere*, they have different effects from others. I deſire alſo the favour to know, how much of ſp. * may be thought a large doſe, and whether it be that ſp. * which is made with ☿, whereof we have prepared ſome. The particulars of the proceſs Mr. *Thomas* has undertaken to give you

you an account of. Sir, having from a paſſage in your writings taken the firſt notice of the time of gathering pæony roots; and ſince finding it in the obſervations communicated to *Riverius*, where the obſerver ſays it muſt be *inclinante luna in ariete exiſtente*, which alſo *F. Wurtz* confirms with this addition, that it muſt be in April, when Sol is in Aries, and at a plenilunium before the riſing of the Sun. I rode to a place, where was pretty good plenty of male pæony, and on the 14th inſtant between ten and eleven in the morning had ſome of the roots dug up, and am promiſed others to be dug up on the 30th inſtant before ſun-riſing. If there be any advantage in the time of gathering, I owe the knowledge of it ſo much to you, that I ſhould be an unworthy reader of your writings, if I ſhould not return you my thanks, and offer you ſome part of thoſe roots, from whom I learnt the uſefulneſs of them; if you pleaſe to make trial, whether theſe have any more virtue than thoſe gathered at another ſeaſon, I having choſen thoſe times, that I think come neareſt to their directions. I intend to go between this and Eaſter into *Somerſetſhire*, where if I can do you any ſervice about *Mendipp*, or any other way, you will oblige me with the employment. It is ſo much my concernment to receive your commands, that I ſhall be ſure to give you notice where I am, and how I may receive the honour of your letters. After ſome little ſtay in that country, I hope to kiſs your hands in *London*, and I now begin to make wiſhes, that you will come hither very quickly. I am,

Honoured Sir,

your moſt obedient, and

moſt obliged ſervant,

JOHN LOCKE.

MR. *Thomas* preſents his ſervice.

HAVING followed your directions the beſt I could with ♈, and ☌ ☉, having drawn ♈ from it till it comes off ſweet, I find the remaining matter when dried retains its acidity, and will not any part of it ſo diſſolve in ♈ as to paſs through a filter, but will eaſily make a maſh with it; but being ſet to digeſt it ſubſides, and leaves the upper part of ♈ clear; whether it ſhould be ſo I know not.

Exeter-houſe, Nov. 12, 1667.

Honoured Sir,

I KNOW you will pardon the ſilence of a man, that hath regard to your time, and is loth to importune you with inſignificant compliments. And I will aſſume ſo much pride to myſelf, as to believe, that you would not think me ſo fooliſh as to venture the loſs of your good opinion, or rob myſelf of the advantage of your letters, by a bare negligence, or for want of writing a few lines. This confidence of your favourable thoughts of me, and an unwillingneſs to trouble you with reading an empty letter, made me forbear ſending to you, though I muſt confeſs, I have a long time wiſhed for a fair opportunity to beg ſome communications from you, without which I ſhall be able to ſend but a very ill furniſhed letter to my friend in *Germany*. I ſome time ſince received from him one of thoſe Scarabei I formerly mentioned to you, which I gueſs to be the *Proſcarabeus fœmina* mentioned by *Mouſet*, Cap. XXIII. and would be very glad to know, whether *Jacob Bobart*, or any other, have found that kind in *England*, for he very much commends the uſe of them in the diſeaſe I told you. The place I am at preſent in, and the remove I am like to make (for I believe I ſhall once more croſs the ſeas before I ſettle) have kept me from attempting any farther experiments in chemiſtry, though I find my fingers ſtill itch to be at it, and I have not met with any thing worthy your notice. I can only inform you, that I am acquainted with a young gentlewoman, who ſome years ſince had the misfortune to have one of her legs cut off, which yet very frequently does ſo pain her, that I have heard her more than once grievouſly complain of vehement torture, ſometimes in the heel, ſometimes in the inſtep, and at other times in the toes of her dead and buried foot; and ſhe tells me, that ſometimes being wakened by the pain, ſhe has (before recollection) put her hand down to feel for the grieved part, as if her leg had not been cut off. I return you my humble thanks for that preparation of *Helmont*, and the other favours of your letter. The odoriferous oil of vitriol, if it be made by any other or ſhorter way than by digeſting ♈ on ☌ ☉, you will do me a favour to let me know it; for for ſuch trials I may perhaps get conveniency this winter, and I would not willingly be idle, where I might be encouraged and directed by ſo kind and ſkilful a hand. But I ought not to be begging more, where I am ſo much indebted already, and have nothing to repay, but an aſſurance, that I am,

Honoured Sir,

your moſt humble, and

moſt obedient ſervant,

JOHN LOCKE.

Paris, June 4, 1677.

Honoured Sir,

IF in an abſence, longer than I thought when I ſet out, I have not once writ to you after ſo many obligations, that I have to ſeek all occaſions to teſtify my reſpects to you: you will not, I hope, impute it to want of knowledge in me, or a willingneſs to decline

cline your commands. I am not ſo inſenſible of your favours as to be guilty to that degree. And if my omiſſion be culpable, it was only out of conſideration, that being in a place, where I had no proſpect of any ſervice I could do you, I forbore to give you the trouble of an idle letter. Now I am come to this place, which is one of the great magazines of things and perſons of all ſorts, I thought, that perhaps there might be ſomething, wherein I might be here in a condition to ſerve you. And though I believe you are not much concerned to know, whether broad or narrow brim'd hats be like to carry it this ſummer, or which is the neweſt alamode cut of pantaloons; yet in this univerſal mint of new things, there are ſome others, that poſſibly you will think worth your enquiry and knowledge. In ſomething of this kind I would be glad to have the honour of your commands; and methinks whilſt the preſs furniſhes every day new books to St. *Jaques Street*, the obſervatoire, laboratories, and other officinæ of the virtuoſi here are ſo buſy to produce ſomething new, I ſhould not be without ſome employment from you. I dare undertake for myſelf, that I ſhall be a very faithful and diligent factor; and you cannot blame me for deſiring the employment, ſince I may inrich myſelf in it very honeſtly, without at all leſſening any part of your returns. And to confeſs the truth, I have beſides this another private intereſt of my own in it; for who ever ſerved you in any thing without being an extraordinary gainer by it? I would beg the favour of two or three lines from your hand, to recommend me to the acquaintance of any one of the virtuoſi you ſhall think fit here. I know your bare name will open doors, and gain admittance for me, where otherwiſe one like me without port and name, that have little tongue, and leſs knowledge, ſhall hardly get entrance. Pardon, I beſeech you, this freedom I take; your goodneſs hath taught it me, and however faulty it may be, let it paſs under the plauſible title of *libertas philoſophica*. They talk here of a little braſs globe three or four inches diameter, that being wound up once a month, ſhews all the motions of the heavens. I am ſo newly come hither, and am ſince my late ague ſo ill a walker, that I have not yet ſeen it. But I hope in a little while my legs will come again to themſelves, and be able to carry me about luſtily; and then I ſhall be trudging up and down in queſt of new diſcoveries. Excuſe, I beſeech you, Sir, the trouble and confidence of this letter, and give me leave to aſſure you, that I am,

Honoured Sir,

your moſt humble, and

moſt obliged ſervant,

JOHN LOCKE.

YOUR letters will find me, if they be directed to me, *Chez Monſieur Charas maiſtre apothecaire rue de Boucherie dans le Fauxbourg St. Germain à Paris.*

Blois, Auguſt 6, 1678.

Honoured Sir,

YOU will not wonder, that I lay hold on ſo fair an occaſion of preſenting my ſervice to you, when you reflect on the many great obligations I have to you, and that I ſhould be very unworthy of the honour I have to be known to you, did I paſs by any opportunity to expreſs my acknowledgments. I ſhould think it a great advantage to me, whilſt I am abroad, if you would honour me with any of your commands. And if in this part of *France* I am now rambling, your curioſity had any enquiries to make, I ſhould with great ſatisfaction embrace the commiſſion, and be ſure to give you an exact account. I have news from *Paris*, from an ingenious acquaintance of mine there, that a friend of his hath found out a very ſenſible hygrometer, which, beſides marking the moiſtneſs of the air, will alſo be improved to wind up a pendulum; which, if it ſucceeds, will be a kind of perpetual motion. And a watch-maker I know there ſends me word, that he is now at work upon a movement, that the air will wind up; which, I ſuppoſe, is the execution of the deſign my friend (who is a very good mechanick, beſides an admirable ſcholar) ſent me notice of. He alſo mentioned to me the extraordinary goodneſs of a microſcope Mr. *Huygens* has brought with him out of *Holland*. But theſe things having happened in *Paris* ſince I left it, I cannot give you ſo perfect an account of them, as I deſire. When I was there, I ſaw in the Charity a boy about eighteen years old, who had a kind of horns grew out in the place of his nails of almoſt all his fingers or toes; ſome of them were four or five inches long. I have a large piece of one of them, which was broke off in my preſence, and the whole hiſtory of the caſe amongſt my things at *Paris*. This accident began to grow upon him, after the ſmall pox, about two or three years ſince. Enquiring for him a little before I came away, I was informed, that he was cured and gone. Some other things worth obſervation I have alſo light on, which would be too long to trouble you with here. And, amongſt other things I have a ſmall quantity of a medicine given me, which I believe to be of great efficacy to certain purpoſes, whereof perhaps you will not be diſpleaſed to ſee the effects. I was extremely well pleaſed to hear, that the things were ſent me from the Bahamas were put into your hands; they could not have been placed any where ſo much to advantage, and to my deſire. For I ſhall always be exceeding glad, if any thing I have or can may ſerve to teſtify the reſpect and eſteem, wherewith I am,

Honoured Sir,

your moſt humble ſervant,

J. LOCKE.

IF at any time you deſign me the honour of a letter, it is but ſending it to Sir *John Banks*'s in *Lincoln's-Inn-Fields*, and it will find the way to me.

Bexwells, June 16, 1679.

Honoured Sir,

TO keep my promiſe to you concerning that odd caſe I met with the laſt year at *Paris*, I here ſend you a more particular account of it.

BEING the 24th of May, 1678, at the hoſpital called *La Charité*, I was there ſhewed a lad between nineteen and twenty years old, who had a ſort of horns grew out of all his fingers of both hands, and moſt of his toes. On the two leaſt toes of each foot there were now none, upon three whereof there had never been any, and upon the fourth, which (as I remember) was the little toe of the right foot, that, which formerly grew there, was fallen off about ſix months before, and came no more, but left the nail very little different from natural. On all the reſt of his fingers and toes there were of theſe horny ſubſtances, when I ſaw him, but of very different lengths, ſome of them having began to ſprout a long time after ſome of the others, and others of them having been broken off by the ſurgeon, that healed him.

THE longeſt of all was that on the middle finger of the right hand, when I ſaw him, which was three inches and nine grys long, and one inch ſeven lines in girt, of which the ſurgeon broke off a large piece, and gave me, which you may command, when you pleaſe.

THE youth told me, he had had one formerly on his thumb, much longer and bigger than this on his middle finger, but it was now very ſhort, having either fallen off, or been taken off, I know not whether.

THIS horny ſubſtance grew not out of the end of the fingers, but was, as it were, a riſing of the nail, which, inſtead of growing out in length, increaſed in thickneſs; but yet it roſe not up in a ſtrait line perpendicular to the finger, but, as it lengthened, bended forwards, and ſo grew ſomewhat into the ſhape of a bird's claw, but that it was not taper and ſharp, like that, but blunt at the end, and almoſt of the ſame bigneſs all along, and full of pretty deep chaps in the convex part, but in the concave there were none at all.

THEY were very tender, eſpecially thoſe of his feet, ſo that he complained upon very gentle touching them; but this ſenſibility was not in the horny part, but where it joined on to the fleſh, which was where the nail formerly grew, and ſhould ſtill have grown.

THERE grew alſo horny excreſcences, ſome bigger, ſome leſs, on ſeveral parts of the backs of his hands, that roſe very little above the ſkin; ſome of them looked like flat, but very broad warts, but to the touch they felt as hard as horn.

HE told me it was about three years before, that this began firſt to come upon him after having had the ſmall pox; to the remains of which diſeaſe he imputed this accident, he having elſe enjoyed a health good enough, and kept the ordinary diet of his country, which was Brie.

ABOUT a week after, I went to the *Charité*, to ſee him again, and then, after having been twice purged, ſome of the horns of his fingers began to looſen at the roots.

I WENT thither again to ſee him, ſome time after, but he was gone perfectly cured, as they told me; and that the chief things were done to him were, purging and bathing.

BEFORE I conclude, I muſt not forget to tell you, that the meaſure I made uſe of was the philoſophical foot, *i. e.* $\frac{1}{3}$ of a pendulum of ſeconds, which I divided thus: the foot into ten inches, the inch into ten lines, the line into ten grys; ſo that a gry is $\frac{1}{1000}$ part of PP; which meaſure, whatever it be for other purpoſes, I thought the fitteſt for philoſophical communications, and therefore made uſe of it in this and ſeveral other occaſions. But I have troubled you too long already to mention here the conveniencies of this foot, and (as I think) of the way of dividing it by decimals.

I KNOW you think the works of nature worth taking notice of, and recording too, even when ſhe ſeems extravagant and out of her way. This muſt be my excuſe for ſending you this long, and (as it would be to another) tedious ſtory, to aſſure you, that I am with the utmoſt reſpect,

Honoured Sir,

your moſt humble, and

moſt obedient ſervant,

J. LOCK.

Amſterdam, Oct. 10, 1687.

SIR,

YOUR goodneſs, I promiſe my ſelf, has preſerved me a place in your memory, however I may ſeem to have taken little care of it myſelf. And you will eaſily forgive me a ſilence, which, though in all this time of my abſence it has not afforded you a word, yet has had nothing of forgetfulneſs in it, or want of reſpect. Whilſt I met with nothing on this ſide the water, that I thought worth the communicating to you, I believed myſelf diſpenſed from importuning you with my letters. For thoſe of bare civility and compliment I know you neither want nor deſire. But this incloſed paper newly falling into my hands, freſh from the preſs, and carrying with it the air of ſomething more intelligible and ſincere, than is uſually found in this ſort of writings, I could not ſatisfy the deſire I always have to render you any ſervice I can imagine may be acceptable to you, without ſending it you as ſpeedily as I could; eſpecially ſince I can add this farther concerning it: that I am told

told by a knowing man, and an acquaintance of the publiſher, that he has reaſon to think, that the whole work, whereof theſe aphoriſms are but the ſkeleton, if it were publiſhed, would far exceed all, that is yet extant on this ſubject. I ſhall be glad, if I may be capable of doing you any other ſervice, whilſt I am in this country. Whenever I ſhall be ſo happy, be pleaſed but to ſend your commands incloſed to your acquaintance, Mr. *Benjamin Furley*, at *Rotterdam*, and they will be conveyed to me. I am,

SIR,

your moſt humble

and moſt obedient ſervant,

J. LOCKE.

Oates, Oct. 21, 1691.

Honoured Sir,

BY this bearer, my ſervant, who comes to town on purpoſe, you will receive your papers concerning the titles of the air. I have read them all over very carefully, numbered them according to the titles they belong to, and laid them in that order, the beſt I could, according to the ſtate they are in. I have beſides corrected many of the miſtakes of your amanuenſes; but yet, for all this, they are not in a condition to be ſent to the printer, or put into a bookſeller's hand, in order to publiſhing. For beſides that they are not all laid in the order of the titles they belong to, it often happening, that thoſe of different titles are writ in the ſame paper, which I would not venture to cut in pieces, without your direct order; and ſome of them being writ on both ſides the leaf, cannot be cut; and therefore I have contented myſelf only to mark in the margin the title each belongs to: beſides this, I ſay, there are ſome faults in the writing, which, without conſulting you, I durſt not correct; and in other places defects and omiſſions, which I could not ſupply; and many things, which ſuggeſt queries, which I think fit to adviſe with you about. I know not whether you think it neceſſary to haſten the edition of them. If upon that or any other account you deſire my coming to town, I ſhall not fail, upon the firſt ſummons, to wait upon you. I have with them ſent a copy of my regiſter of the air, and in ſome few places made ſome little additions to the obſervations of your papers, as you will ſee; and I doubt not, but, if one had time, one might find many more. Beſides the many ſtrange and pleaſant remarks your papers contain, and uncommon experiments you have made yourſelf about the air, your deſign opens a large and uſeful field, and I muſt confeſs gives me a larger view than I had before of this ſubject, which yet I have a long time thought deſerved as much to be conſidered, as any part of nature; and which your diſcoveries had ſo much recommended to the ſtudy of all inquiſitive men. But enough of the air on this occaſion. Give me leave now to tell you, that I have water, and I have veſſels, I only want ſoap to be at work. Whatſoever you ſhall give this bearer for me will be ſafely brought me. I hope he will bring me good news of your health, and I ſhall be glad to receive the honour of your commands by him. I am,

Honoured Sir,

your moſt humble, and

moſt obliged ſervant,

J. LOCKE.

I HAD forgot to mention above, that I have a little altered ſome of your titles, the better, as I think, to accommodate them to the papers are to be ranged under them. You will find the alterations I propoſe writ on the backſide of the printed titles, and I know you will pardon this preſumption, ſince I ſhould not make a right uſe of the freedom you expect from me, ſhould I not without reſerve offer my thoughts to you.

AT the end of all you will find ſome papers which I am in ſome doubt about, whether they ought to have any room at all amongſt the other.

WHENEVER you have any commands for me, a letter left at my lodging in *Dorſet-Court* in *Channel-row* will be conveyed to me.

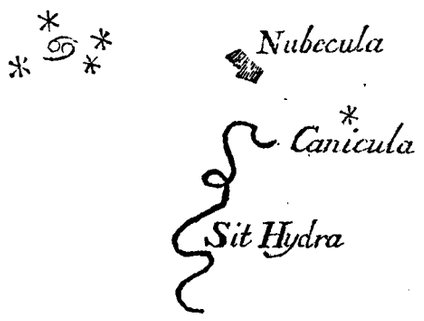
Letters from Mr. Aubrey *to Mr.* Boyle.

Eaſton-Pierſe, March 15, 1665.

SIR,

I HAVE here ſent you, tranſcribed with my ill hand, Mr. *Pell's Idea*, which, I doubt not, but will be very welcome to you. I humbly beg your pardon, that I could not ſend it ſooner, having, ever ſince I had the honour to wait on you, been diverted by ſeveral buſineſſes. I was overjoyed with the good news, which you told me of, that Mr. *Pell* was about finiſhing his Algebraical Treatiſe; I hope it is the *Mathematicus* Αὐτάρκης. I have long been ſo perplexed with the unpleaſant affairs of this earthen world, that I cannot mind ſo much as I would the intellectual one; and ſo am not capable to make you ſuch returns of diſcoveries and fine things, as you expect, and I wiſh. Hereafter, I ſhall be able to add ſomething to your Hydroſtaticks, but they being at preſent unfiniſhed, I will not offer them now; yet as to that part they are, and long ſince by me propoſed, at *Greſham* college, with the ill ſucceſs as not to be taken notice of, the experiment being not rightly made. Upon Candlemas-eve laſt was twelvemonth (which was ſhortly after the appearance of ſeveral comets) about ten at night accidentally looking on a ſerene ſky, I took

notice of a nubecula, much brighter than any part of the via lactea, and about five times as big as Sirius. I ſhortly after ſhewed it to my ingenious neighbour colonel *Long*, and another neighbour: when the moon ſhines not too bright, it is very eaſily ſeen, and remains yet; but I cannot ſay, whether altogether ſo bright. It lies almoſt in a right line, between the bright ſtar of the little dog and ♋,



and it is near upon over the head of hydra. After a month's time, you will with difficulty find it, by reaſon of the lightſomneſs of the ſky. Hereafter, when God ſhall bleſs me with a little more peace, I ſhall make bold to ſend you ſeveral experiments, ſome whereof may not be ungrateful. I would willingly take the hardineſs to deſire your reſolve in this Georgic problem. There is a ſort of huſbandry upon the downs called *Burnebeking*, which is to dig up the ſurface of the barren downs, and make little hillocks of the turfs, and then ſet them on fire; afterwards ſcatter the burnt earth, and then plough it, and it will yield for ſeven, eight, nine years, or more, a wonderful increaſe, but afterwards never bear any thing, even ſo much as good graſs, in the age of a man. For the proverb is, It is good for the father, but naught for the ſon; for it is left *a terra damnata*. It would be an excellent diſcovery to bring ſuch land to its former ſtate; and I am confident you are able to reſolve it *primo intuitu*. I do believe, (but for a great quantity of down it would not be *tanti*) that urine well ſcattered would go near to do the buſineſs. My obſervations of my Turquois, I will ſend you about a month hence, with ſome other ruſtick ones, ſome whereof I do not diſdain to learn from ignorant old women. But becauſe you have encouraged me, and honoured me ſo much with your favour, I have preſumed to offer to you theſe rude and haſty lines, which otherwiſe I ſhould not have had the confidence to do, to a perſon of your eminence and ingenuity. Thus humbly begging your pardon, I ſubſcribe myſelf in haſte,

SIR,

your moſt obedient, and
moſt humble ſervant,
Jo. AUBREY.

SIR, you would much oblige, in preſenting my humble ſervice and reſpects to my noble lord *Brereton*, and his ingenious friend Mr. *Pell*.

IF you have any commands to lay on me, be pleaſed to direct your's from *London* to the poſt-houſe in *Chippenham*; from *Oxon*, to *Kingſton* St. *Michael*.

Hothfield, Sept. 6, 1672.

SIR,

I SUPPOSE it is not unknown to you, that Mr. *Wood*, of *Merton* college, hath writ the Hiſtory of the Univerſity of *Oxford*, which is in the preſs. In every houſe he mentions the writers there bred, whoſe lives he traces from their cradles to their graves: he correſponds much with me to give him aſſiſtance herein, and lately, among other queſtions, deſires me to ſend him an account of Mr. *Saunderſon*, who writ the life of king *Charles* I. who died at *Lees*, the earl of *Warwick*'s, where (by my lady) I underſtand you now are. Sir, you will oblige Mr. *Wood* and myſelf very much, if you will deſire one of your ſervants to make enquiry,

Where Mr. *Saunderſon* was born?
What employment or preferments he had? He was of *Trinity* college.
If he writ any thing elſe?
When, and where, he died, and was buried? and his epitaph, if any?

Let your ſervant ſend the beſt account of theſe queries he can, to Mr. *Wood*, at *Merton* college. He hath made a collection in this method of above 800 writers. I humbly deſire your pardon for giving you this trouble of reading it; but it being to carry on ſo publick a work, I preſume the more on your goodneſs.

MY lord of *Thanet*, and my lady (your pious and ingenious niece) remember them kindly to you. My lord is much hypochondriack; I told him of aſhen rinds infuſed in white wine, which I know hath to my relations done great good. His lordſhip intends to take it, but commanded me firſt to deſire you to acquaint him, when, how much, and how long he muſt uſe it; which, though I conceive it be *ad libitum*, yet, for his lordſhip's ſatisfaction, I would deſire you to let him know your opinion. I reſt,

SIR,

your moſt affectionate, and
moſt humble ſervant,
Jo. AUBREY.

SIR, If you would be pleaſed to look in your cabinet for my Turky ſtone ring, you would much oblige me: I would make ſome farther obſervations on it.

SIR, I newly have received a letter from *Herefordſhire* from Mr. *Hoſkyns*, wherein is this recipe for Mr. *Hooke*, if he mends not upon milk. He ſays, an old man near him begged his landlord to give his children one year's purchaſe of his eſtate (for life) and he would ſurrender; but his landlord thought of entering in a month's time. A beggar woman adviſed the conſtant uſe of new butter-milk,

milk, which recovered him from his maraſmus, and preſerved him thirty years, to bury his landlord and landlord's heir.

Letters from Mr. Colepreſſe *to Mr.* Boyle.

Underwoode, near *Plymouth*, Aug. 28, 1666.

Much honoured Sir,

MY occaſions not permitting me, till yeſterday, to view the cave mentioned ſome time ſince by his majeſty to you, I humbly offer this imperfect account of it, having not as yet the conveniency of ſeeing what the earl of *Bath* hath ſecured in his cloſet in the Fort Royal (in which this place is) which I gueſs, by hearſay, to be not much other than great iſicles. The cavity I conceive to be natural, lying on the edge of a clift towards the ſouth, though there are many looſe uneven pieces within it: it is generally above and beneath uneven, ſhooting itſelf into many cranies: the top, or roof, is about five or ſix feet deep from the ſuperficies of the earth; its height is about ſixteen feet, and fifteen feet ſquare, beſides the nooks. The marble, or rock, of itſelf is of colour a dark blue, but hath a coat, or cruſt of darkiſh yellow, which is the deſcending water (though a rocky, dry, and barren place over) there firmly petrified. Iſicles, ſome of a very great compaſs and length, others leſs, were in it, but now it is left naked: but that, which cauſed my admiration moſt, was (what had eſcaped others, as the diggers told me, having otherwiſe no different matter from other caves of the like nature) *viz.* certain veins of a very ſoft matter, which being preſſed, but gently, though in the hand, yields two parts in three of water. I cannot demonſtrate it better, than by curds and whey, it being exceeding white, though otherſome partaking more or leſs of a red, which colours our country marble; by which I labour to ſatisfy myſelf of the degrees of natural petrification, which I as yet never heard any to diſcourſe of, ſo I could never meet with a more apt and certain demonſtration, which I perceived a little in the iſicles. This place, though natural, from many imperfect relations conjoined I gather to have been opened before; finding great bones (ſuppoſed of horſes) in the entrance into it: and, as it hath been Æolus's palace a long time, it is now to be dedicated to Bacchus, being intended for a wine-cellar. Sir, if any of theſe curds be worth a ſecuring, on the leaſt intimation from you, I ſhall double my intended quantity, which will be ſpeedily, or not at all, they daily endeavouring to bring it to a better form. Noble Sir, you ſee into what depth of preſumption I have plunged myſelf, that I might comply with your deſires, humbly imploring the favour to be eſteemed

Your honour's moſt humble,
and moſt obedient ſervant,
SAM. COLEPRESSE.

SIR, I have ſome other things, (ſeeming rarities to me) which I now forbear, fearing I prove tedious in this: but of them hereafter, if my mouth prevent not my pen. I have begun my collection of minerals for you already; neither doth Sir *William Strode* forget the loadſtones.

Underwoode, nigh *Plymouth*, Feb. 1, 1666-7.

Noble Sir,

WHEN I waited on your honour laſt in *London*, you were pleaſed to commit ſome queries about mines to my cuſtody, with a requeſt (which I ever eſteem as my command) to give you ſome ſatisfaction concerning our weſtern mines, by anſwering them; the which ſhould I by delays or negligence diſobey, I could not in reaſon expect to be accounted ſo much your (faithful, though unworthy) ſervant, as indeed I am. I have therefore incloſed a ſhort and haſty account. Such as it is, I humbly offer to your candid view. Indeed the ſhortneſs of time, illneſs of the ſeaſon, emergency of other avocations ſince my return, and want of convenient inſtruments, have much added to its imperfection; which I hope will the ſooner be excuſed, ſeeing it is neither my profeſſion, nor can I arrogate (as yet) the title of novice in mineral affairs; I can ſcarce intitle myſelf to them, otherwiſe than by compoſing and tranſcribing. For I muſt ingenuouſly acknowledge the greateſt part of them to be received from your worthy friend, my noble Mæcenas, *viz.* Sir *William Strode*, who gives his humble and hearty ſervice to you; who has newly opened the mine, you were pleaſed to afford your aſſiſtance in obtaining the leaſe for; and has already met with a firm load of magnetick ore, whoſe vertue much exceeds that formerly found on the top, having taken up ſome of an hundred and fifty pounds bulk. There is a reddiſh brown ſpar in it. They meet with antimonial ore alſo, and hope to make ſome farther diſcoveries in it. The miners, that dig in this work, find their right arm to be much pained, eſpecially when they grow thoroughly warm in their beds: their hands likewiſe are for ſome ſmall time contracted, and as it were ſcrimmed, by handling the magnetick ore, with its earth about it. The antimonial ſpirits or ſteams cauſe them (ſtrong healthy perſons) to vomit and purge luſtily. In his ordinary tin-mines he has lately met with ſeveral ſtrange loads, as ſome of marchaſites, and black ſtone; ſome with marchaſites in clay; and other ſome being broken very like the Guinea ore you gave me in *Oxford*; of which, and others, if you pleaſe to command any quantity to be ſent you up, Sir *William Strode* has ordered me to acquaint you, they are ready; or if you ſhall be pleaſed to reſpite them, till you come down into theſe parts, for Sir *William Strode* lays hold on your promiſe made to his ſons (who tender their moſt

moſt humble ſervice to you) of viſiting him, and thoſe parts, this ſpring, where you will find a moſt hearty welcome, and it may be ſome content, in the many ocular demonſtrations our mines and country may afford you, and may not fail of any thing convenient for an elaboration. Sir *William Strode* hopes you have not forgot the promiſed improvements of tin. Sir, the ill luck I had in my glaſſes (having broken all in carriage, except the tube, which you gave me; and that too, a ſevennight ſince, juſt as I was about to fill it with mercury, provided for that purpoſe; which unhappy accident ſuddenly daſhed all my great hopes of the future contentment I promiſed my ſelf in making experiments in the depth of mines, on the top of high hills, and on the ſea, at ſome diſtance from the land, and other places with it) makes me become an humble ſuitor to your honour for more, encouraged by your noble promiſe of baroſcopes, thermometers, hygroſcopes, inſtruments to find the degrees of heat and cold by a glaſs bubble in a cylinder of glaſs filled with water, inſtruments to weigh water by caſting them into it, and inſtruments (if of glaſs) to meaſure the ſtrength of the wind; humbly requeſting, that the glaſs tubes for the Torricellian experiment may have *Hermes*'s ſcale, becauſe there is ſomewhat more in melting the glaſs, than I am aware of. The carrier, that I employ to bring them down for me, comes out of *London* to morrow three weeks, *viz.* the 23d of February; before which time my friend Mr. *Batten* ſhall wait on your honour, for directions of incloſing them the ſafeſt way, who will ſee them carefully delivered unto the carrier. I humbly beg your pardon, as for my confidence in begging (aſſuring your honour, if any benefit may accrue by their uſe, and obſervation, it ſhall moſt gratefully be returned, only the pleaſure detained to compenſate my pains) ſo for my boldneſs in giving you the trouble to read me,

Your honour's

moſt humble admirer,

and moſt obedient ſervant,

SAM. COLEPRESSE.

SIR, if you deſire any further ſatisfaction to any particular queries, I ſhall be ready to perform it to the utmoſt of my power.

Incloſed in the preceding.

Anſwers to the queries of the honourable Robert Boyle, *touching mines in* Devonſhire *and* Cornwall, *Feb.* 1, 1666-7.

Tit. 1. 1. OUR country is generally mountainous, diſtinguiſhed with vales, the hills much elevated, unequal in height, fruitful enough in the ſummer time to feed cattle and ſheep, temperate, but exceeding rocky and ſolid, running confuſedly in ridges, from weſt to eaſt, nothing parallel the one to the other.

2. THOUGH the mountains in winter be exceeding cold, yet in the vallies they feed both oxen and ſheep all the winter at graſs, moſt commonly without hay.

3. HORSES, bullocks, and ſheep, all of an ordinary ſize, colour, ſhape, longevity; the two laſt making very good meat, rather exceeding your eaſtern fleſh in ſweetneſs.

4. OUR inhabitants, eſpecially in the moſt mineral places, are very healthy, and live commonly to a great age.

5. THIS country is well furniſhed with brooks, rivers, ſprings, and other waters; ſome phyſical, for inward receptions, others for outward applications, moſt of them well conditioned: the like counties for plenty of rivers are not to be found in *England*.

6. THE air is variable by reaſon of the mountains, mines, rivers, rivulets, and nearneſs of the ſea (whoſe variation in ſhort time might conſiderably be made known by the help of the thermometer, barometer, hygroſcope, *&c.* had, or could I get any in thoſe parts ſo remote from the place, where they may be obtained.)

7. EVERY vein, whether of metal, marble, or ſlate, alters the ſoil over it, both in colour and nature of our marble; red, white, grey, blue and black, well poliſhed, are made curious tables, tombs, monuments, and clovel-pieces; and the beſt, whiteſt, and moſt durable lime. Tit. 2.

8. 9. THE ſigns of mines are commonly on the ſurface of the earth, from whence uſually by art the load is trained. Tit. 3.

10. IT has been obſerved in ground, through which the load of the ſilver mine at *Beere Ferris*, in our county, may probably paſs, that certain places of the ſame mould and depth with the reſt of the ſame field, neither bore corn, though manured, ploughed, and ordered in all reſpects as the reſt of the field, or keep graſs of the like length or greenneſs, but is quickly as it were burnt up, even in the winter: yet good mines, eſpecially of tin, have been found in land worth three pounds per acre (no common price with us) as well as bad, and barren, but commonly in barren ground.

11. TREES and plants (for ought has been obſerved to the contrary) proſper alike.

12. PEBBLES of all colours, weights, degrees of hardneſs, even to the beſt porphyry, are found with us.

13. MUNDICK, or maxy, in tin-mines, makes the waters loathſom to taſte, and ſmell, and gives them a blueiſh reem on the top; ſo does the ſilver ore; but for their containing of minerals muſt be deferred, till farther examination by evaporation, and convenient inſtruments for that purpoſe, be obtained.

14. SNOW lies not any conſiderable time, nor froſt continues beyond what it doth in other places ſuppoſed to be devoid of metals.

15. FUTURE curioſities may inform, where common and blunt obſervations at preſent can give no certain intelligence.

16. IT is not only a common and received opinion amongſt our common miners, but

even verified by the teſtimonies of ocular witneſſes of fiery meteors ſeen in the air by night (which they term the fiery dragon) to have its motion very ſwift from the orifice of one ſuppoſed mine, to the orifice of another neighbouring known one, by which ſome have been encouraged to open. Ignis lambens, and Jack with a whiſp, and a waze, as they term it, are frequent in our parts; ſome of which I have this winter been an eye witneſs of.

17. IN cold mornings great ſteams are obſerved to ariſe out of the orifice of opened mines; and they of *Beere-mine* prove not only copious, but very offenſive to the ſmell.

18. BY report the virg. divin. has been uſed in thoſe parts with good ſucceſs.

19. ONLY the ſhode, which lies upon the ſuperficies of the earth, and in the adjacent rivers and brooks.

20. THERE are clays, marles, and earths, by which the load is adjudged to be nigh; but they are ſo differing and varying, in reſpect of their depths, and colour, as can ſcarce be reduced to any certain rule.

21. MARCHASITES are found; but it is moſt commonly the mineral ſtone, that is looked for.

22. STONES are known by their colour, weight, grute, and countenance of ore.

23. CHANGE of earth adviſes where to look after it.

24. THERE are no known or perceivable damps above ground, thereby to indicate a mine; for they may ariſe, where is no mine within ſeven miles.

25. SOMETIMES they meet with water before they come to the load, but when they come to the load itſelf, they meet with the greateſt ſtream, which is carried through the heart (as they ſpeak) of the load.

26. BY the ſhode under the ſuperficies of the earth.

27. FINDING no ſhode, ſignifies their loſs of the load.

28. THE diſtinct and determinate kind of metals, or minerals, is known by the ſhode alſo, the plenty, by its ponderouſneſs.

29. WHEN they come to the ſhelf, they know that the load, or ſome ſtring, is nigh at hand ——— but

30. IF, when they come to the ſhelf, they find no ſhode, or meet not with a ſtring, they know they have miſſed the load, or intended place.

Tit. 4. 31. THE ſhaft is commonly five, ſix, or ſeven, ſometimes ten or twelve foot deep.

32. TIN uſually runs eaſt and weſt, ſeldom north and ſouth. In the higheſt mountains of *Dartmore* it dips towards the ſouth, in the lower mountains towards the north; ſome dip more, ſome leſs, ſome perpendicular. Sometimes it runs horizontal. It has frequent flexures north, and ſouth, and commonly retains the ſame form in ſeveral loads.

33. SOME five or ſix foot long, and half as broad, perpendicular.

34. THEY are ſupported with timber, where it needs, which happens not always through the compactedneſs of the ſoil; but when it does, they uſe four foot ſtrong laths, three wall plates, and three foot ſtemples, which, if of good oak, may laſt ſeven years.

35. ONE air-ſhaft (in caſe of a damp) three foot broad, and five foot long, two fathoms diſtance from the groove, and as many from that again to another, if neceſſity require it.

36. THEY meet with plenty of waters (as before) in the heart of the load.

37. THEY increaſe ſo much in the winter, that they oft enforce them to deſiſt from working. They diminiſh in the ſummer. For the proportions, they are not ſo curious.

38. 39. COMMON pumps, winders with barrels, ſome with bags; where a conveniency is, they make an adite, which they begin at the bottom, or loweſt place, and ſo drive up on a level, till they come to the work.

40. GREAT damps commonly ariſe from mundick in the tin-mines, which perceived aforehand by the miners, through the filthy ſmell and dimneſs of their candles, immediately makes them give over, and leave the mine, till they make their air-ſhaft. Three men, ſome four years ſince, were killed by the ſudden damps in a tin-mine, called St. *Anne*'s, ſome eight miles beyond *Truro* in *Cornwall*.

41. 42. OUR common miners make no known uſe of the magnetic-needle.

43. THEY ſometimes uſe fire, made of hard wood and furſe, to ſoften and calcine the great rocks they meet with; ſometimes getting ſixty ſeams, or horſe loads, out of one rock.

44. THIS happening but ſeldom, the inconveniencies are leſs, and not obſervable.

45. SLEDGES of twenty pounds apiece, and gads, which are uſually new pointed every week at leaſt.

46. IN ſummer they work cloathed in their waſtecoats of thick cloth, and jerkins; but in the winter only in their ſhirts. They uſually burn two candles a day (which is but eight hours, winter or ſummer) of twelve to the pound.

48. THEY get it up in barrels, and hollow trees made to keebles, by winders at the top.

49. TIN uſually lies in a vein, or load, Tit. 5. as it were a wall between too rocks, which is obſerved in the ſilver-mine throughout. It is ſometimes interſperſed in the firm rock; it is very oft found in grains, live gravel, which is termed grain, or ſtream tin, and the works called ſtream works. Sometimes it runs out of its harder conſiſtence into a clay; as Sir *William Strode*, ſince my return, has found a very ſpecious metal in clay, which is ponderous. Sometimes the load runs along in a free ſoil, without any teguments or medium of any petrified body, between the load and ſoil.

50. No metal (only that little gold as yet found with us excepted) is found complete, or neat, in our parts.

51. THE gold is found in thin plates of different dilatations, ſometimes like ſhot, but not

not obſerved as yet to keep any ſhape or figure of other bodies deſigned by nature.

52. THERE is no exact proportion of diſtance from the ſurface of the earth obſerved by nature; for ſometimes it is nigher, ſometimes farther off.

53. TIN ſeldom has a twofold coat, more oft a ſingle ſpar. The ſilver mine has always a twofold coat, ſomewhat like the ſkin in man.

54. TIN has, in ſome few places (to its prejudice) ſtore of mundick mixed with it. There are ſeveral ſorts of weed mixed with the tin, as mundick, white like ſilver, yellow like to gold, calx, ire-mould, daxe, *&c.*

55. THE anſwer annexed to this quere may not be augmented.

56. MOST commonly incloſed on every ſide.

57. TIN loads are ſometimes two or three foot over, at a little diſtance ſcarce an inch over: digging perpendicular (which way the common miners ſuppoſe the load to be got down to the center of the earth, they find it to ſpread, and then grow narrow again. The teguments are uſually proportionable to the vein, or load, included.

58, 59, 60, 61. SOMETIMES it runs out into very ſmall veins, which as it were loſe themſelves in the earth; ſometimes degenerates into a clay, as before; ſometimes into ſtone.

62. THERE may be different ores (in reſpect of goodneſs) found in one load, which are differenced by the terms of fat and poor.

63. BIGNESS of the grain imports the fateſt tin.

64. THREE gallons (containing about ſixty pounds per gallon) of black tin, that is prepared for the fire, commonly produces an hundred pounds of metal, at one hundred and twenty pounds to the hundred. But ſome metal yields more, ſome leſs.

65. OUR tin ore very frequently is mixed with mundick, cale, daze, *&c.* our iron with gold and antimony.

Tit. 6. 66. TIN always, even that, which is found in grains, muſt be prepared, though the latter with more eaſe, by ſtamping, or knocking mills, which reduce the whole body to a very ſmall ſand; after which it undergoes a ſeparation, in water, which carries away the heterogeneous bodies, leaving the oar behind, ſunk to the bottom.

67. BY reaſon the extraction of noble metals is ſo little practiſed at preſent (but may in time be more) in thoſe parts, I muſt be ſilent in this practical account.

68. TIN and ſilver ore are not expoſed to the open air, or rain, as preparatives; yet our old tinners ſay, that tin rails being expoſed for ſeven years, the mundick is rotten, and the tin receives an heart.

69. BEATING, or ſtamping (as before) is always a preparative for the furnace. And burning is always uſed in the tin ore, which contains any mundick, to burn away the mundick, which is burnt without wind in half an hour's time (and it is obſervable, that while the mundick is burning away, the flame is exceeding blue; and not only the men, that conſtantly attend the fire, whilſt it is burning, do ſometimes break forth about the mouth and face after a ſtrange manner; but even the cattle, which graſe where the fuliginous and fumous matter of the mundick may be ſuppoſed to fall, loſe almoſt all their hair) but then the black tin is taken out of the fire, cooled of its ſelf, rewaſhed, and caſt up again.

70. No flux-powders are uſed in tin.

71. THEY melt their tin ore by the force of fire.

72. No conſiderable difference in the furnaces.

73. AN account to this and others may be expected hereafter.

74. THIRTY packs of charcoal (made of oak, but principally of furſe, which by experience is found to run the metal ſooner, and waſte leaſt, each pack containing three buſhels of eighteen gallons to the buſhel) laſt a whole week: yet in *Devonſhire* they uſually burn moor, or turf-coal, with good ſucceſs) at a very cheap rate. In *Cornwal* they have uſually run down eight hundred pounds of ordinary (but one thouſand pounds of the beſt) ore in a tide, as they term it, which is twelve hours; with us ſcarce the moiety of it, to which the Corniſh men reduce their proportion, for by running down ſo much, the greatneſs of their fire rather burns, than melts their ore, loſing thereby above one in four.

75. No additament is uſed for tin.

76. THE tin-ore is melted with a wind actuated by the blaſt of bellows moved by an over-ſhoot water wheel.

79. THE metal being melted, runs down into a float, and from thence laden out with an iron ladle into various moulds.

80. WHICH are cut according to fancy in moor-ſtone; letting the metal cool of its own accord.

81. THEY rectify the fire and wind, if it either be exceſſive, or defective: the ſkill and cunning of melting eſpecially conſiſting in this particular, *viz.* the degree of fire and wind.

82. To take out the droſs, or mundick, which ſometimes remain, they are enforced to melt down their metal again.

83. IF there remain any droſs, it is always in the bottom of the globe.

84. THE beſt metal comes down firſt; only in one work, it is obſerved, that the beſt comes laſt.

85, 86. THE more it has of mundick, or other weed, the leſs price it yields; for ſometimes a globe may be tardy ten pounds.

87. THIS (as above) ſometimes happens in tin, to get out the remaining mundick. Their preparation is only to chop it in little bits, or pieces, and ſo throw it up, as before.

88. THERE are ſome corpuſcles elevated, which, for the greateſt part, are a metalline flower (though ſome are eaſy enough to be diſtinguiſhed) reducible into a maſs, without any conſiderable diminution of its ponderouſneſs.

89. IN the common tin-ore one thouſand pounds of tin yields three hundred pounds of ſlag; which, being prepared in the ſtamping-mill, is thrown up again into a furnace,

which yield ſome conſiderable portion of tin.

90. THE tin-ſlag may, by being expoſed to the open air and rain for a time, be ſooner prepared in the mill, and melted down; but whether it yields more, or better metal, I cannot yet underſtand.

Undſrwoode, March 19, 1666-7.

Noble Sir,

THAT my ſenſible acknowledgments of your great favours had been no ſooner on their way to attend your honour, proceeded not from that abominated principle of ingratitude, but my obligement to be at our aſſizes held at *Exon* the laſt week: and therefore am the eaſier induced to hope for your pardon of a conſtrained backwardneſs in returning my moſt humble thanks for the box of glaſſes, which came ſafe to *Plymouth*, March 5. but the two water-gages were by a great froſt broken, March 7. before they came to my hands. I hope you have received by this time a box of ores, which by Sir *William Strode*'s order I ſent away from *Brent*, March 1. principally intended for preſent experiments, not for your mineral repoſitory; for which I am daily ſolicitous to prepare a box of mine own collection of the diverſities of ores, weeds or marchaſites, clays, and earths, our mines and country afford, together with a diſcourſe of the art of training, digging, dreſſing, and blowing of metals, as an addition to what I formerly (though haſtily) preſented your honour with on the like ſubject. But this I fear may not be ſo quickly effected, as otherwiſe I could wiſh; ſeeing he muſt patiently wait, not only for a bare opportunity, but even a good humour, wherein to treat with our ſkilful miners, that intends to receive any ſatisfaction to his demands of this nature. That unlucky humour of ſullen and ſurly reſervedneſs being commonly annexed, not only to the ſkilful, yea and pitifully ignorant profeſſors thereof, but even the profeſſion itſelf: and here I muſt humbly beſeech you not to conſtrue it a wilful neglect in me, if it come not ſuddenly. I had the good luck to meet with this good humour once, which I was not over-backward to improve by getting an ample account of training; neither do I doubt (in time) of the reſt. Sir, I was lately, by the common brute of a new metal found in ſuch a place, invited to view the ſaid place (though ſome miles diſtant from me) not altogether loſing my labour (yet meeting with no other metal than the black flint in its embrio;) for in a perpendicular body of ſand (ariſing even with the ſurface of the earth in the ſide of a high cliff) ſome forty feet over, incloſed on each ſide with huge continued rocks of marble; I obſerved a little vein of odd clay about four inches thick, and five over, to run quite through the middle of the ſand horizontal. Its colour is much red, mixed with ſome ſtreaks of white, exceeding cloſe and ponderous; eaſily diviſible into angulous forms, much like the little ſhelfy ſtone, which induces me to believe it is the marble (of that colour) in its embrio, though by many degrees more petrified than ſome ſuch ſuppoſed matter I formerly ſaw, and, as I remember, gave you an account of, obſerved in the (ſometime talked of) cave at *Plymouth* (this place is not far from it.) Its taſte is ſo pleaſingly ſweet, and its matter ſo fat, that I could ſcarce content my palate with the modicum of an ordinary trial. In the ſame ſand I found an earth of a blackiſh colour, running confuſedly in veins alſo very fat and light; of a ſweet taſte, and pleaſant ſmell, being chafed between the fingers, colouring them and paper with an indifferent glaſs, on which I immediately writ without any great difficulty, though laid on pretty thick, without any mixture of a moiſt body, yet lying dry in a box (in a chamber) above theſe five weeks.

I CANNOT pretend to ſuch a compliance with Sir *William Strode*'s deſires, as his merits and my many obligations lead me to, without acquainting you, that we have an old woman in our parts, who is eminent for the cure of what has been accounted the opprobium medicorum, *viz.* the opening and clearing of the obſtructions of the milt when diſordered, only by the exquiſite ſenſe of her hand performed by ſtroking the reſpective vein without any other perceivable ceremony: a good experiment whereof ſhe has lately wrought on Mr. *Charles Strode*, the youngeſt of the two gentlemen, that were with me in *London*, who was for ſome time ſenſible of a continual and almoſt inſupportable pain in his left ſide, and ſhoulder, who felt the pain to fly from place to place under the good woman's hand, immediately after a quarter of an hour's ſtroking; and the place in his ſide, where his pain (juſt before ſtroking) lay, to be very hollow, even to admiration. She has performed moſt notable cures of this nure.

WHAT you mentioned concerning Minver ore, *viz.* lead and antimony, I am ignorant of; neither doth Sir *R. W.* remember, that he preſented you with any ſuch; but if it be any, that was preſented you by my hands, you may have any quantity you ſhall be pleaſed to command. Fondly perſuading myſelf, that ſuch relations will not be overmuch diſpleaſing to your honour, I have given the greater liberty to my ſcribbling pen, humbly craving your pardon for being too tedious, and leave to ſubſcribe,

your honour's deeply obliged,

and moſt obedient ſervant,

SAM. COLEPRESSE.

WE want not waters, but inſtructions how to make good vitriol. Juſt now the abovementioned old woman came in, who tells me

ſhe had this ſkill communicated to her by a Dutch ſurgeon of a ſhip brought in priſoner to *Plymouth* about forty eight years ſince, living in the houſe as a ſervant then, where this Dutchman performed a notable cure on her maſter: but he added, that ſhe would never be perfect in this ſkill, till ſhe had ſeen a perſon opened, which ſhe did about twenty years ſince, from which time ſhe has never failed in the cure. She has publickly profeſſed it theſe ten years, and is now teaching her daughter the ſaid ſkill.

Underwoode, June 15, 1667.

SIR,

RETURNING from *Cornwall* the laſt week, I found at *Nunam* the two glaſſes mentioned in yours of May the 18th, but indeed not without ſome wonder (for they were ſent to *Wells* in *Somerſet*, a road far diſtant from ours, and accidentally lighted on by a ſervant of Mr. *Strode* of *Barrington*-houſe, in that county, to me a ſtranger, who yet, out of his reſpect to Sir *William Strode*'s name and family, took care, though through ſeveral hands, for its ſafe arrival) a favour, when I wrote laſt to your honour, that was then as far beyond my expectation, as it is now above my abilities enough to acknowledge. I had not the convenience of taking any of the ſtrong ſpirit till this morning in Borage-water; ſome of the good effects whereof I am even already very ſenſible of, by ſmelling thereunto, confidently preſuming on its intended admirable effects. Sir, I dare aſſure myſelf it will not be overmuch diſpleaſing to you to read an account (by way of return together with my moſt humble thanks for thoſe many renewed favours your honour has been pleaſed to grace me with) of ſome few baroſcopical experiments, which I offer not as new; but farther confirming your hypotheſis touching the weight of the air. On May the 25th (67) I filled my tube with ☿ (having beſtowed ſeveral days ſpace to cleanſe it from other droſſy dirty bodies mixed with it) according to the uſual way; which immediately upon the inverſion thereof, ſubſided at 30 inches and $\frac{1}{4}$ of an inch, and ſo remained till the Monday following, when by ſeven in the morning I carried it up half ways a meanly elevated, but ſteep hill, where, upon faſtning it to a tree, the ☿ preſently ſubſided at $30\frac{1}{2}$: and coming to the top of the hill it deſcended to $29\frac{7}{8}$: the weather was very fair, and hot, but a briſk eaſterly wind, about full ſea. Upon my coming down, I placed the B. on the ſame tree at the middle of the hill, and found it quickly riſen again to $30\frac{1}{2}$, which cleared my doubts of any miſtake: but placing it in a cellar, lower in the valley, than our houſe ſome few fathoms perpendicular, it aſcended to $30\frac{9}{12}$, which was the higheſt I ever yet obſerved the ☿ at. But repeating this experiment on the ſame hill, at the ſame places this morning, being cloſe, but fair, when I went out of our houſe, I found it to fall ſhort $\frac{1}{12}$ of what the ☿ proportionably fell the firſt experiment, *viz.* that $\frac{1}{8}$, this but $\frac{9}{12}$; which ſeems ſomewhat ſtrange unto me, unleſs the falling of a ſhower, and full ſea, when I was at the top, might cauſe it to aſcend; for indeed the ☿ was higher on my coming down at the middle of the hill by above $\frac{1}{12}$, than it was at the ſame place when I went up; and it riſe almoſt $\frac{1}{12}$ on my return above what it was in my chamber above an hour before. May the 7th I attempted to know, what alteration in reſpect of weight the ſound of bells did make in the air, placing my B. without the bell-chamber door in the midſt of a peal; but could perceive none (which I attributed to the too much air, and ſome water in the tube, it being then unſkilfully filled) but obſerved this, that the impriſoned or latitant air in the body of the ☿ did nimbly and frequently enlarge its ſelf, by getting up in little bubbles into the empty part of the cylinder, which I humbly conceive was merely ſet at liberty by the effects of the ſound on the air; and that at ſeventy feet's height the ☿ fell about $\frac{1}{8}$. I have not as yet found the ☿ to be lower than 29. My late indiſpoſition of health, and ſome other private buſineſs has hindered my proſecuting ſome (more curious) intended experiments and the gaining the remainder of my promiſed mineral account, which I hope very ſpeedily to effect. I had made ready ſome of the ſuppoſed talc with ſome other minerals: but being adviſed by Sir *William Strode* to reſpite them, who hopes you will begin your journey for thoſe parts before the box may arrive; and conceiving your own choice on the place may be more pleaſing, I forbear to ſend them up, and further to trouble you at this time, than to read me,

Your honour's infinitely obliged,

and moſt obedient ſervant,

SAM. COLEPRESSE.

SIR *William Strode* and his ſons preſent their humble ſervice to you.

Nunam ☿, Nov. 13, A. 1667.

SIR,

AS I came from *Plymouth* this morning, I very fortunately met with the conveniency of Mr. *Verman*'s ſpeedy intentions for *Oxford*, whereby I am only enabled at preſent briefly to acquaint you with my receipt of both your extraordinary favours, that of the ſpirits laſt Friday, and of the book but this very morning; and with the return of my moſt humble and heartieſt thanks to your honour for them, I took ſome of the ſpirit in pimpernell-water (the firſt that came to hand) laſt Sunday morning with very good ſucceſs: the ſenſe and vigour whereof by Monday morning expelling in a great meaſure,

that of ſtupifying pain, which has all the laſt ſummer ſomewhat (though not ſo much ſince the uſe of your former ſpirituous medicine) afflicted my head, and but little leſs impaired all the exterior and interior ſenſes; but I truſt by God's bleſſing on this medicine will be recovered again. I have lately on requeſt from Mr. *Oldenburg* made a ſmall mineral collection for your Society, intending ſhortly to ſpeed it for *London*, and to incloſe a copy of its catalogue for you, with an account (to me and others ſomewhat odd) of the operative effect of the oleum ſuccini, or it may be of your former ſpirit, in my head, which my haſte at preſent will not permit, being to go into the Eaſt for ſome few days very early to morrow, if the weather hinders not. The ☿ in the barometer has within thoſe few weeks meaſured all the degrees betwen 30½, and 28. I humbly beg your honour to pardon this ſo ſlender a return as being ſudden, and leave (though abruptly) to ſubſcribe

your honour's moſt obliged,

and moſt obedient ſervant,

SAM. COLEPRESSE.

Leyden 4, Aug. 30, A. 1668.

Noble Sir,

IF this attain the honour of kiſſing your noble hands at *London*, together with the worthy Dr. *Sampſon* (my honoured friend) I may hope for your excuſe of my more than uncivil ſilence, and this the ſooner, by the advantage of his mediation, whoſe parts and travels cannot be but well pleaſing, if you fall on that ſubject.

I KNOW not, whether it may be new to acquaint you, there is a blind man at *Copenhagen* can as well diſtinguiſh colours by his touch, as he at *Utrecht*. This I am aſſured of by an ingenious perſon of this academy, that came lately from thence, and has accurately repeated the experiment ſeveral times.

SIR, my preſent deſigns are to ſettle here for ſome time, making divinity my principal ſtudy. If you ſhall be pleaſed to honour me with your commands, it will not only be matter of great comfort, but an occaſion of expreſſion, how much I deſire to be continued in the quality of

Your honour's humbleſt and
moſt obedient ſervant,

SAM. COLEPRESSE.

ANY ſuperſcription for me a ſtudent at *Leyden* may come ſafe.

Leyden, h Apr. $\frac{3}{13}$, 1669.

Great Sir,

IN the beginning of January laſt, on the return of a ſtudent here from *London*, I received by Mr. *Oldenburg*'s means, the honour of your incomparable piece, the Continuation of New Experiments, *&c.* as from your honour: whereby my ambition immediately challenged the ſubſcription of *Ex dono nobiliſſimi authoris*. But this return was ſo early ſucceeded by a new arrival of the learned and judicious Mr. *Bernard*, and Dr. *Wallis*'s hopeful ſon, full fraught with your noble and affectionate remembrances of me; but withal adding, even at their entrance, that they ſhould as ſpeedily conſult a return; that it is all the apology I can frame to excuſe myſelf from more than uncivil neglect, in not making my humble acknowledgments (which is all your honour at laſt muſt accept of for your weighty favours) much ſooner; unleſs your kindneſs ſhall well interpret the fear I had to preſent you with but too coſtly thanks. And now before I mention this laſt (whoſe title page I may, by leave, juſtly alter thus: A continuation of renewed experiments of ſignal favours towards *S. C.* by the honourable *Robert Boyle*) and that unparallelled piece, the Origin of Forms, and Qualities (and indeed the origin of your favours to me of that quality) I muſt add theſe two divine pieces, your never enough to be acknowledged Style of Holy Scripture, and Seraphick Love, and return you innumerable moſt humble and cordial thanks; for the two former in a more eſpecial manner, the latter on a general account; a haſty ſight of which I got ſo long as to peruſe ſo much (by an Oxonian's favour, that went ſuddenly for *England*) that I find myſelf, and thoſe (it may be) that have ſpent more years in that ſacred ſtudy, than I as yet weeks, to be highly engaged to expreſs our ſenſe of that almoſt unimaginable favour you ſhewed our robe, in vindicating that, on which our whole ſtructure ſtands, and taking off a calumny, but too often made uſe of by the nobler ſort, *viz.* that what the *Theologi* write on that ſubject is but partial, and, that they do it more for the maintenance of their profeſſion, than out of pure ingenuity, and their own natural perſuaſions, *&c.* Sir, if I am incapable to preſent you with an account of what new notions and experiments are, or may be, ſprung and practiſed here, in medicine or chemiſtry, you will, I doubt not, forgive me, ſince I have betaken myſelf to pry a little into that ſtudy of ſtudies, wherein I begin to find in a few weeks, and as few ſheets, very many inextricable difficulties, and ſubtileſt nodes (perchance firſt ſought for by the ſchoolmen) yet perceive a far greater difficulty (nay as yet altogether impoſſible) to reconcile what in moſt books is laid down ſo poſitive, and ſeeming plain, to my undirected intellect, where it may be lies the defect. Heartily glad ſhould I be, could I receive ſatisfaction from a perſon, that would but deal ingenuouſly with me, (the moſt part as yet telling me, this, and this, we muſt believe and ſay, but why, and how, nay what we know not,) even in things, that have the general repute of being moſt orthodox.

YESTER-

YESTERDAY I received an anſwer to ſome mineral queries, I formerly ſent to *Copenhagen*, by his means, that addreſſed it to me, whoſe name it bears. His correſpondent there aſſures him, he had it from the able and experienced Dr. *James George Secmann*, which I humbly offer you, (on the ſcore you were pleaſed ſometime ſince to recommend the mineral queries) together with a few of our diſputations; which, if with the ſeries of mineral ones, not yet compleated by the profeſſor, four or five wanting, ſhall be but graced with your acceptance, though I intend them not to repreſent any new thing to you, but as a teſtimony, that I have a ſenſe of thoſe many ſtrong obligations you have been pleaſed to lay on me, and very earneſt and affectionate deſires of performing ſome piece of real ſervice to you, if ever occaſion may preſent, it cannot but infinitely engage,

Noble Sir,

your moſt humble, and

moſt obedient ſervant,

SAM. COLEPRESSE.

MR. *Strode* paſt ſafe hence to *Flanders*, by the way of *Amſterdam* and *Utrecht*. I ſhould have preſented you now with *De Raie*'s Oration *De Sapientiâ Veterum:* but underſtanding Mr. *Oldenburg* has it, and Mr. *Bernard*, I forbear, till it be compleated by a ſecond, which is to come, on which that extant depends. I have not foreſtalled Mr. *Bernard*, whoſe quality entitles him to more curious narrations, than I can attain the knowledge of.

SIR *William Strode*'s news of your viſiting thoſe parts will be exceeding well-pleaſing.

Letters from Dr. Hyde *to Mr.* Boyle.

Queen's College, *Oxon*, Feb. 14, 1666-7.

Worthy Sir,

PREMISING my ſervice and thanks for all your favours, I make bold to preſent here unto you a paper tranſlated out of ſome Arabick and Perſian authors, giving an account of ſome of thoſe things enquired after in your monthly Tranſactions. The firſt is of ſal ammoniacum, called by the Perſians Nuſhâdur: and this name may be lawfully written ſeveral ways, as alſo Nuſhâdir, or Alnuſhâdur, or Alnuſhâdir, or Annuſhâdur, or Annuſhâdir; and no otherwiſe, although in ſome chemical books it is ſo ſtrangely deformed, that one could ſcarce gueſs it to be the ſame word. The ſecond thing is of petrifaction, and the third of amber, which is the very name, which the Perſians and Arabians commonly call it by. I have likewiſe incloſed a letter to Mr. *Denton*, at *Conſtantinople*; which if you can ſend, you will do me a great favour; which I humbly entreat of you, becauſe I myſelf am wholly unacquainted with the method of ſending to thoſe foreign places, and ſo cannot give myſelf any aſſurance, that my letter ſhall arrive at the deſired place, unleſs it be by your aſſiſtance. I alſo intreat you to be pleaſed to let me know, where I may find the quotation you once mentioned to me concerning *Hermes*'s triple book, occaſioned by me telling you of ſuch another book fathered upon *Zoroaſtes*, or, more rightly, *Zerdúſht*. Dr. *Pocock* is recovered of that dangerous lameneſs and ſore by his heel, which kept him within doors ſo long. The lord of *Oſſory*, lord *Douglas*, and Sir *Nicholas Armorer*, were created doctors of law, as they paſſed through *Oxford*, and ſeveral noblemen of the univerſity were together at the ſame time created maſters of arts. Thus craving pardon for giving you ſo great trouble, I ſubſcribe myſelf,

SIR,

your very much obliged

friend and ſervant,

THO. HYDE.

I HAVE among other things deſired Mr. *Denton* to enquire, if there be any chemiſts about *Conſtantinople*, and to get as many of their books as he can, if there be any; and alſo to enquire for any, who have written of minerals, or any other ſuch curious ſubject.

Queen's College, *Oxon*, March 4, 1666-7.

Worthy Sir,

WITH my thanks for the trouble I have given you already, I make bold, according to your advice, to ſend here another letter to the ſame effect as the former, intreating you to be pleaſed to convey it for me. If for the future I meet with any thing in oriental authors, that may illuſtrate natural knowledge, I ſhall be ſure to take notice of it; and I hope hereafter I may be capable of doing you more conſiderable ſervice, when my buſineſs of making the Catalogue is finiſhed; I now having very little leiſure to make a ſearch, except I can recollect any things, which I have read heretofore. I hope likewiſe we may obtain more conſiderable books of ſuch kind of learning, if we can procure ſome perſon or other to defray the charge of buying them; for their books being all written with the hand, are twice as dear as printed books are here in *England*, except one, who lives upon the place, will be very diligent in watching good opportunities of getting them cheaper. If you can poſſibly recollect the citation of the triple book of *Hermes*, I ſhould be exceeding glad to know it, when you come to *Oxford*. In the mean time, I remain,

SIR,

your much obliged

friend and ſervant,

THOMAS HYDE.

IN

IN the papers I ſent laſt, there is a note concerning oud, that it ſignifies properly lignum aloes; and that is, indeed, the uſual acception of it in moſt authors. But I find ſince, in *Emircond*, a Perſian hiſtorian, ſome mention of oud, and he ſaith, that the Indian oud is like to wax, and melteth, if it be put to the fire. And if ſo, then amber may properly enough be called by the ſame name, as it is in the Perſian author, whence the papers I ſent were excerpted.

Oxon, Saturday, May 20, 1671.

Worthy Sir,

FOR the ſatisfaction of you and my other friends, with whom you ſhall happen to converſe, this is to aſſure you, that this very hour (it being ſix of the clock in the evening) I have finiſhed my long and tedious work of the Catalogue, ſo that it ſhall not lye at my door any longer. The next thing is to get in as many new books as we can, and ſo put it to the preſs as ſoon as the act ſhall be paſt; for I ſuppoſe it can hardly go to the preſs before that time. No more at preſent, but only to ſubſcribe myſelf,

SIR,

your very much obliged,

and moſt humble ſervant,

THOMAS HYDE.

Oxon, Oct. 23, 1671.

Worthy Sir,

I HAVE here ſent you ſome rude papers upon the beginning of Geneſis; they are yet but imperfect, becauſe I ſuppoſe, that upon ſecond thoughts I ſhall both add and alter abundantly, as I ſhall hereafter ſee occaſion. In this manner I ſhall go over the whole Pentateuch, if you think it worth the while. And I intreat you to be pleaſed to tell me freely, what you miſlike, either in my matter or method; for I have not gone ſo far, but that I can eaſily change them both, if it ſhall be thought fit. My method is to give a true account firſt of the Hebrew words, and, ſecondly, to examine how far the oriental verſions do agree with, or diſagree from, the original. For Latin interpreters have not always done their part, ſometimes for want of ſkill, and ſometimes being fearful to recede too far from the Hebrew; ſo that the oriental verſions are many times not ſo well interpreted as they ought to be; and therefore it ſhould ſeem neceſſary to examine them particularly and critically, which I ſhall do according to my ſkill, if it may be acceptable; and in what I ſhall in this kind perform, I ſhall always uſe my own judgment and my own genius, before I look upon any author's, becauſe I will not be led by them. But after I have firſt tried my own ſkill, then I may conſult other criticks, to ſee how far they and I do agree or diſagree: for I do not account it any thing worth for me to collect what others have done already; if I cannot produce ſomething that is new, I ſhall forbear to ſay any thing: and therefore I ſhall conſult chiefly ſuch authors, as have not been peruſed by Europeans; and if, out of thoſe my eaſtern authors, I can, towards the explication of the ſcripture, produce ſuch things, as have not been yet found, or rightly applied, by other men; then I ſhall think my time and labour well beſtowed, and that my eaſtern ſtudies have attained their right end, *viz.* the glory of God, and the edification of others in the truth and right underſtanding of his word. But neither to this, or any other of my own ſtudies, can I apply myſelf, until I have got ſome acceſſion to my livelihood, that ſo I may be delivered from the ſlavery of labouring for my bread. Wherefore you would eternally oblige me, if by any of your friends you could procure for me ſome good prebend or ſine-cure, or maſterſhip of an hoſpital, or any ſuch kind of thing, which would not too much call me off from my ſtudies. As ſoon as I can receive information in one or two particulars from beyond ſea, which I every day expect, I ſhall ſend you ſome of my obſervations, in which I have taken more elaborate pains, *viz.* an account of the bird dukiphath in Leviticus and Deuteronomy; an account of the hyſſop mentioned in ſcripture, wherein ſome other obſervations about herbs are accidentally mentioned; and, thirdly, you ſhall have a true and full account of the doves-dung eaten in the ſiege of *Samaria*.

I INTREAT you to be pleaſed to uſe your endeavours to ſecure the Eaſt-India chaplain's place for Mr. *Fraunce*, for I do verily believe he will be an induſtrious perſon in his duty, and he is alſo willing to tarry beyond that time, which is prefixed; and, ever ſince I mentioned it to him, he doth depend upon it. We have here lately, upon the death of Mr. *Wilkins*, choſen one Mr. *Waſe* to be our archi-typographus and beadle: he is a very good ſcholar, tolerably well verſed in ſeveral both eaſtern and weſtern languages, and is an excellent critick in Latin and Greek, and is a very ſtudious and induſtrious man; and yet our heads of houſes are much offended, only becauſe he was not the man, whom they aimed at. There was alſo the king's letter, which named no man in particular, but did in general adviſe us to chooſe a fit perſon.

THESE firſt papers, which I here ſend, perhaps may not be ſo pleaſing to you, becauſe they have ſo many things in them, which are merely grammatical; but when I come a little farther to deal with paradiſe and its rivers, that will afford other kind of matter. In the mean time I remain,

SIR,

your much obliged, and

moſt humble ſervant,

THOMAS HYDE.

Thurſday, Feb. 1, 1671.

Worthy Sir,

I RECEIVED your laſt, and my friend Mr. *Fraunce* is ready, at the very firſt ſummons, to come up to *London*. He is a good ſcholar, a perſonable man, and of ſober converſation, and uſually pleaſeth very well in his faculty of preaching. He would come up to *London* preſently, but he is not well able to bear the charge of lying there, it being a chargeable place: and therefore I would intreat you to be pleaſed to order the buſineſs ſo, that he may be called, when the time is very near, if it be not ſo already. I ſuppoſe it is a conſtant cuſtom to let the chaplains have a part of their ſtipend beforehand, by way of advance, that ſo they may fit themſelves with clothes and books, and other neceſſaries for ſo long a voyage. And therefore my friend hopeth and dependeth upon that favour, that he may have thirty or forty pounds advance money, which ſhall be accounted towards the payment of his ſtipend, which the company uſually allow to their chaplains. I have here incloſed a few lines of chemiſtry, which I endeavoured to tranſlate out of an Arabick author, who hath ſome few more things of the ſame nature. But I find, that it is a hard matter to tranſlate any thing in phyſick or chemiſtry, except a man takes a pretty ſufficient time to inſtruct himſelf in the terms of art, and other præcognita, which are neceſſary for a good tranſlator of ſuch things: and he who, ſetteth raſhly upon it without ſuch preparation, can hardly expect to come off ſo well as he ought, although otherwiſe perhaps he may be tolerably verſed in the language he dealeth with. If I hear nothing more from you by the next poſt, then my friend ſhall come to *London* next week: but if without danger of miſcarriage, more ſpace may be allowed, then I intreat you to be pleaſed to ſignify the ſame to,

SIR,

your much obliged, and

moſt humble ſervant,

THOMAS HYDE.

Incloſed in the preceding.

The compoſition of the grand and univerſal elixir, according to Geber.

SCITO coryphæum Gjaberum certiores nos feciſſe in relationibus ſuis ex Socrât, quòd elixir perfectum eſt illud, quod ducitur ſeu regulatur ex omnibus corporibus.

COMMENTARIUS.

Dico quòd in faciendo hoc elixire perfecto ſunt modi ſive ingreſſus, ſeparationes, et trutinationes, deducta à re ſubſtratâ dividenda. Et hoc eſt, ut corpora impura fiant pura munda, adducta ſeu vergentia ad rubedinem. Debet [*debent*] *eſſe de Saturno 3. de Jove 4. de Marte 5. de Sole 6. de Venere 7. de Mercurio 8. de Lunâ 9. Liqueſiant Mars & Venus primò: poſt completam purificationem* [*depurationem*] *et mollificationem,* [*lenificationem*] *tum adjiciatur illis Jupiter, deinde Saturnus: tum paſcatur tota maſſa malgamatione, quæ fit ex duobus luminaribus et Mercurio, paulatim; donec ſe tota abſumpſerint in maſſam per 3 horas. Tum evacuetur tota maſſa in locum unum de novo in oleum dulce et defæcatum* [*clarum.*] *Tum ſumatur tota maſſa, prout eſt corpus unum ſtans ſeu conſiſtens in medio corporis novi, in quo eſt compoſitio ſecundum modum medium, et adjiciatur ei de coronâ victoriæ quantitas tertiæ partis ponderis ejus. Tum imbibat imbibitiones decem, donec perficiatur elixir perfectum proficuum ad magnam utilitatem.*

Gjaber docuit operationes elixiris ex animalibus, ex herbis, ex lapidibus, et miſcuit aliquot operationes alias cum aliis: et commemoravit elixir compoſitum quod imbiberit de aquâ (ſucco) herbarum et tinctûrâ animalium, &c.

COMMENTARIUS.

Ad ejus explicationem dico, quod elixir perfectum, quando pervenerit ad completionem ſuam juxta modum medium, et imbiberit de tinctûrâ animalium ſubtiliori, quæ fit ſicut ſimplex, tum amplectetur eam ad perfectionem ſuam, et convertet eam in ſeipſum, infiget in eam tincturam ſuam, et fixabit in eâ utilitatem ſuam. Et ſic eſt opinio noſtra de tinctûrâ ſpecierum aliquot herbarum ſalutiferarum veneno expertium, quòd viz. earum elixir perveniet ad effectus magnos ac utiles in omni eo, quod poteſt eſſe propter medicinas morborum ac infirmitatum: eò quòd hoc elixir colligit quicquid eſt utile ex herbis et animalibus, et ſolvit et condenſat: eſt enim antidotum magnum et elixir univerſale: et ceratium (i. e. pondus ceratum) ex eo prodeſt ad utilitatem magnam, per Dei permiſſionem.

Si autem pars elixiris imbiberit de ſucco herbarum venenatarum, aut fellibus animalium venenatorum, uti ſunt viperæ, pardi, et animalia rapacia; tale elixir erit venenum lethiferum interficiens mero tactu celeriter: et granum ex eo (i. e. pondus grani tritici) interficiet elephantem, qui exinde fiet venenoſus: (viz. caro ejus fiet venenoſa.) Deus autem nos liberet ab hoc. Et quidem hujus mentionem non feciſſemus, niſi ut ſolveretur id quod poſuit (i. e. aſſeruit) Gjaber, ut explicaret nobis quid in elixire eſſet utilitatis aut noxæ; ita ut ſi fortè obtinuerit aliquis elixir quoddam ex theſauro aliquo, aut illud ſibi comparaverit à medico, non procederet ad medicinam exercendam per illud, donec ſciat originem ejus et ſummum ejus, et ex quibus rebus ſit compoſitum.

As for that on the other ſide this paper *, I think I have tranſlated right enough; but on this ſide † there is more difficulty, ſo that I being not an adeptus, or ſon of art, cannot be altogether ſo certain, whether I have expreſſed all things ſo punctually right as they ſhould be. But I have endeavoured, as near as I can, to expreſs the ſenſe of the Arabick words of my author; and, I hope, that I have not very much miſſed his ſcope. I ſuppoſe

* Viz. from *Scito coryphæum* to *tinctûrâ animalium.*

† Viz. from *Ad ejus* to *compoſitum.*

poſe *Socrât* may be the name of ſome of *Geber*'s books; otherwiſe I know not what it is.

WHAT is here in this paper included in parentheſis, is my own edition, and not the words of my author.

Oxon, Sept. 3, 1676.

SIR,

DOCTOR *Marſhall* preſents his humble ſervice and thanks for your readineſs to favour him: but I doubt Mr. *Watſon* hath left *London* by his father's importunity, ſo that all buſineſs with him is at an end at preſent.

As for the Malayan goſpels, they were printed in Dutch and Malayan at *Amſterdam* 1651, in quarto. I ſuppoſe they are done after the Dutch verſion, which is according to *Beza*. The two former Evangeliſts, *Matthew* and *Mark*, were turned into *Malayan* by one *Albert Ruyl*, the two others by one *Jan van Haſel*; and in our edition the Acts of the Apoſtles were added by one *Juſtus Heurnius*, who profeſſeth to have corrected the verſion of the Evangeliſts, and compared it with the original text. So that I ſuppoſe the verſion is exact enough, they being miniſters and chaplains there, who did it, by the command of the *Heer Generael Pieter de Carpentier*. I am ſorry I could not meet with the lord *Berkeley* to pay my reſpects and thanks to his lordſhip: wherefore you will favour me, if you pleaſe to preſent my humble ſervice and thanks to his lordſhip, and let him know, that I was four or five times to have waited upon him. I doubt the nights are grown too cold for the Eaſtern ſeeds, neither is there ſummer enough to bring them to perfection; ſo that perhaps it will be beſt to keep them till next May.

I MOST humbly thank you for your readineſs to help my friend Mr. *Broom*, when you ſhall find it may be conveniently done. In the mean time I remain,

SIR,

your deeply obliged, and

moſt humble ſervant,

THOMAS HYDE.

Oxon, Eaſter-Tueſday, 1667.

SIR,

I HAVE by Mr. *Moor*'s waggon ſent for you a little packet, which contains ſeven ſheets of the Malayan goſpels: what we have already done takes in the beginning of the goſpel of St. *John*. I intreat you to be pleaſed to let your man call for it at Mr. *Moor*'s ware-houſe at the *Saracen's-head* without *Newgate* any time on Thurſday, for it will come to *London* on Wedneſday night. As for the Arabick book of curious receipts, whereof you deſired the heads, I have looked upon it, and do find, that the heads are too general to do you any ſervice: as for example; chapter concerning puppet-plays; chapter concerning tricks with rings; chapter concerning tricks with cups and glaſſes; chapter concerning tricks with fireworks, and ſo the reſt. Now under each of theſe heads or chapters he brings divers inſtances to his purpoſe, which muſt be given in particular, whenever they are to be ſerviceable. In the mean time, for your preſent ſatisfaction, I ſhall give you this brief account, *viz.* That upon peruſal of the book, I am not of the ſame opinion with Mr. *Watſon*, who thought all things were put under diſguiſed names; for to me they ſeem to be written plainly as the author intended them to be underſtood by the reader. But that, which put Mr. *Watſon* into that opinion, might be the ridiculouſneſs and impoſſibility of ſome of them; which I rather attribute to mere ſuperſtition and enchantment, of which many of them do much favour. As for example, To walk on the water, take a piece of the ſkin of a crocodile, and of a ſea-horſe, and of divers other water-animals, and when the ſun is in ſuch a ſign, and the planets in ſuch a conjunction, make yourſelf ſhoes of the ſaid ſkins, and with theſe ſhoes you ſhall walk upon the water, without ſinking. And there are many more as ridiculous as this, which I have mentioned. But of thoſe, which ſeem to be more ſerious and practicable, be pleaſed to take this following ſpecimen. To ſow ſeeds, which ſhall grow up preſently, take Indian barley, and ſeeds of cucumber, and ſteep them in the blood, which comes out of a cupping-glaſs: there let them ſteep ſeven days, ſtanding in the ſun. Afterwards take them out of the blood, and lay them upon a clean paper in the ſun ſeven days more. Afterwards wrap them up in a piece of cotton cloth, and keep them for your uſe. Get alſo ſome of the fine earth, which ſticks to the plough-ſhare in the time of ploughing, or ſeed-time, and keep it for your uſe in a new cotton bag. And when you come into any company, where you have a mind to ſhow this trick, take ſome of this earth (not letting the company know but that it is common earth) and make it into little furrows, and ſow your corn in it, and ſprinkle it well with warm water, and cover it with a cloth born up hollow by little ſticks ſet upright about it; and after two hours it will grow up. When you have a mind to put an egg into a narrow mouthed bottle, or to draw it through a ring, take a new-laid egg and put it into wine-vinegar, in which hath been diſſolved ſome ſal armoniack: leave it to ſoak in this liquor, which will ſoften the egg-ſhell, ſo that you may put it into a bottle. And when it is in the bottle, put ordinary water into it, and it will harden again, and look like a firm egg. When you have a mind to break an egg, and find writing on the inſide of the ſhell, write firſt upon the outſide with water, in which hath been diſſolved chalcanthum, and write the ſame

ſtrokes

ſtrokes over again the ſecond and third time: and after it is dried, throw it down and break it, and you ſhall find red writing on the inſide of the ſhell. When you would have an egg like the ſun-beams, take a freſh pigeon's egg, and by a little hole ſuck out all that is in it, and leave it to dry; and fill it up with dew, and ſtop the little hole, and put it into an hot place, and it will fly in the preſence of the company to their great wonder. To make an egg ſtand faſt upon any convex ſuperficies, though it is ſhaken, ſuck out what is in the egg, and fill it again with quick-ſilver, and ſtop it with wax, and it will ſtand upon any round place. If you deſire to put fire into your mouth without any hurt, take ſal armoniack, and an herb called pyrethrum, and chew them well, but do not ſwallow any of your ſpittle: and then putting an hot iron upon your tongue, it ſhall hiſs, but not hurt you. If you deſire to carry fire, and it ſhall not hurt you, take yellow arſenick and alum, and grind them well together: then take ſome juice of ſenagreen, and ſome of the gall of a bull, and with this anoint your hand, and no fire ſhall hurt it, neither ſhall you feel the heat.

WHEN you deſire to ſet fire on any one's clothes without hurt, take froth of the ſea, of egg-ſhell, and of quick-lime, of each a like part, and grind them well together, and wet them with old wine vinegar: then beſprinkle his clothes well with this liquor, and alſo ſcatter ſome of the dry compoſition upon his clothes, and putting to fire, it ſhall burn without hurting: and when you would quench it, caſt on cold water. Take red arſenic and alum, and work them well together with the white of an egg; and rubbing ſome of it upon your hand, if you carry fire, it ſhall not hurt you.

WHETHER theſe are of any uſe, you can judge: to me they ſeem of but little worth. But there are here and there ſome few thereof, which ſeem practicable, the books being pretty large in quarto, as thick as one's thumb. The author is *Abu'l Kaſim Irakienſis*, commonly called *Sheich Ahmed Irakienſis*. There are in the book many odd words proper to the author's own country and dialect, which are not to be found in any dictionary. But towards the end of this ſummer, I look for two men, who are natives of thoſe parts, who perhaps may unriddle the hard words for me. It were to be wiſhed, that we had in *Oxford* a college for the maintenance of ſome able men out of the ſeveral eaſtern countries; it would be a great help to all eaſtern learning: and when the church of *England* ſhall be ſo zealous as to have a college *de propaganda fide*, ſuch eaſtern men being amongſt us, would enable us to be ſo accuſtomed to the true and genuine pronunciation of thoſe languages, that ſo our emiſſaries might be enabled to diſcourſe readily with the natives; for book-learning alone will not do it. And therefore I, for my own both benefit and pleaſure, do catch at all opportunities of diſcourſing with the natives of thoſe countries in their own languages. But having been too tedious, I only ſubſcribe,

SIR,

your moſt humble ſervant,

THOMAS HYDE.

Oxon, July 31, 1677.

SIR,

YOU may juſtly wonder, that you have heard nothing from me thus long; the reaſon was, becauſe I hoped at one trouble to ſend you the whole, without interrupting you with ſuch frequent letters. But the extreme tedioufneſs of the printer (he having gotten another piece of work into his hands) makes it thus long before I can ſend you the laſt chapter of the Acts, which I had hoped to have ſent above a month ago. But now at laſt I have ſent the whole remainder of the text, which, thanks be to God, is finiſhed.

WHEN Mr. *Hall*, the printer, did at firſt compute the number of ſheets, he over counted it very much; for I now find, that the number of ſheets will not be ſo many, nor the charge ſo great, as he then eſtimated it; ſo that it will not coſt you ſo much money as at firſt I thought. But of what the charge is, you ſhall have a faithful account, and the remainder of the money returned back to you by Mr. *Davis*; for I did let the money remain in his hands, to pay the printer, as occaſion required. We are now printing the title-page and a preface, which I and doctor *Marſhall* have contrived, to give an account of the work, and the reaſon of undertaking it, and what hath been done in that kind, *&c.* And more we ſhould have done, if we could have gotten any helps for the Malayan language in their own characters. Dr. *Marſhall* hath ſhewed himſelf very ready and willing to ſerve you in this buſineſs; for I have given him a great deal of trouble, by going to him with every proof-ſheet, to conſult his copies and dictionaries, about doubts, which did perpetually occur. So that I ſuppoſe you will be pleaſed to beſtow upon him a copy of the book, which we print; and I beg one copy of you for my ſelf; and there are two gentlemen at *London*, who lent us one Malayan teſtament, and gave us another, which aſſiſted us much in the work; ſo that I muſt beg a copy for each of them; and then, according to the act of parliament, there muſt be three copies reſerved, *viz.* one for *Oxford*, another for *Cambridge*, and a third for the king's library: ſo that the whole number will be ſeven copies, unleſs you will pleaſe to take care your ſelf to preſent one to the king's library, you being near it. But, concerning this, I ſhall wait for your farther order. When I ſend the title-page and preface (which I hope will be this next week) then you ſhall have an ex-

act account of the charges. In the mean time I remain,

SIR,

your ever obliged,

and moſt humble ſervant,

THO. HYDE.

Oxon, Aug. 14, 1677.

SIR,

I HERE ſend you the completion of the whole work, which (thanks be to God) is happily finiſhed. In the preface we have diſcourſed concerning the remiſſneſs of our people, in endeavouring the converſion of thoſe poor heathens, of whoſe temporal goods we participate, and of the worthineſs of promoting ſo good a work; and therefore we thought fit to print ſome ſupernumeraries of the preface, that ſo, after the copies are gone from you, you may have ſome of thoſe prefaces by you, ready to communicate to any perſons, whom you think fit for the promotion of ſo good a deſign: and we alſo keep ſome by us at *Oxford*, for the ſame purpoſe. I have cauſed twenty five prefaces to be ſtitched up in blue paper, ready to your hand, and I have ſent them in a packet by Mr. *Moor*'s coach, at the *Saracen's-head* near *Newgate*, where your man may find them. This, which I here encloſe, is to be joined with the ſheets, which I formerly ſent you, to make them up a perfect copy.

IT now remains, that you will be pleaſed to ſend me your order, what to do with the five hundred printed copies of the book. I ſuppoſe you would have them ſent up to you in quires, that ſo you may bind them up as you ſee fit. And therefore (God willing) I ſhall ſend them up to you the next week. Perhaps there may be ſome more than five hundred; but whatever it is, you ſhall have an account by my next letter.

THE printing did coſt fifteen ſhillings per ſheet, viz. fourteen ſhillings to the printer himſelf, and one ſhilling to a corrector, to read it once over by the copy, to cleanſe it from the groſſer faults, that ſo, when I myſelf came to read it by the copy, I might find it pretty well cleanſed.

Now the whole number of the ſheets being twenty nine, twenty nine times fifteen ſhillings makes twenty one pounds fifteen ſhillings. So that of the thirty one pounds ten ſhillings, which you paid to Mr. *Davis*, there remains nine pounds fourteen ſhillings, which he muſt repay to you; only he muſt deduct about half a crown, which we paid for the ſtitching up of the prefaces, and for the carriage back of the remainder of the paper to his houſe. For we having bought too much paper, I deſired him to take back the remainder to himſelf, which was twenty five reams, at ſix ſhillings per ream, which makes ſeven pounds ten ſhillings. So that he is to be accountable to you for nine pounds fourteen ſhillings, and ſeven pounds ten ſhillings, that is, ſeventeen pounds four ſhillings, which will return clear unto you, out of the fifty pounds, excepting only the odd ſhillings abovementioned. He hath promiſed me this day to write to you, and give you the account under his own hand. I have alſo here incloſed the printer's account under his own hand, as he exhibited it to Dr. *Marſhall* and me.

I HAD forgot to tell you, that it is uſual for a book to be preſented to the vicechancellor, becauſe he licenſeth it. And ſince I have talked with the printer, I find, that it is a cuſtom, as well here, as at *London*, for every one in his houſe to have a copy in ſheets, or money for it; wherefore I think it is beſt for you to redeem thoſe ſix copies, which he expects, and give him ſomething in money for them; for you will make a better uſe of them. This is all at preſent from,

SIR,

your moſt obliged

friend and ſervant,

THO. HYDE.

IF you hear of any ſhip going to *Bombay*, I would entreat the favour to have notice of it.

Oxon, Sept. 22, 1677.

SIR,

I RECEIVED your laſt of the 19th of this inſtant, wherein I find, that you do not miſlike my way of directing an epiſtle to you, which we here do alſo judge to be a very fit way. But you ſeem, in the end of your letter, to intimate, that what Dr. *Marſhall* hath ſpoken concerning *New England*, ſhould be taken out: if ſo, it will cauſe the reprinting of one whole ſheet; and therefore I would know your full reſolution about it. It ſeemeth to me, that what he hath ſaid may well enough ſtand; eſpecially becauſe it is no more than what is ſaid in the preface of the bible, or ſome of the books printed in *New England*, and the reflection made upon the opinion or obſervation of *Increaſe Mather* (there quoted) makes for the vidication of our New-Englanders. But after all this, we are ſtill ready to do as you ſhall direct; and Dr. *Marſhall*, who preſents his humble ſervice to you, is ready either to add or alter, or take it quite out, or what you ſhall pleaſe to appoint in your next letter. In my addreſs at the beginning of the epiſtle, I choſe to mention your relation to the Eaſt-India company, becauſe the thing, which we do at preſent, is for the uſe of the Eaſt-Indies. To reckon up all titles, which might be given you, I thought too long for our preſent occaſions, in caſe I knew them all; but I being ignorant in that point, I doubt not but to be readily excuſed from you, who do not affect any titles. But however I would intreat

intreat you to be pleaſed to condeſcend ſo far in that point, as to hint unto me any thing, which may be proper for me to expreſs in my addreſs, that of being one of the commitee being but a ſlender encomium; but only that I thought it appoſite to the preſent occaſion. Yet nothing hinders, but that ſomething elſe may be joined with it, if you think fit, and will pleaſe to give me an hint of what is proper. I have made ſome little addition to the epiſtle, of which I here ſend a copy; and as ſoon as I receive your approbation, or alterations (if you make any) I ſhall with all ſpeed get it printed. In the mean while I cauſed one hundred books to be bound plain, whereof ten a little finer. Theſe ſhall be put into a box, and ſent by Mr. *Moor*'s waggon, where you may have them on Thurſday morning, as alſo the one hundred and fifty unbound copies, packed up in paper only, becauſe perhaps you will open them at *London*; but if they are ſent farther, there muſt be ſome coarſe cloth wrapped over them.

YOUR experiment of light will be very welcome. But in the mean time I would entreat you to inform me, whether Mr. *Davis* ſent unto you ſeven copies, unbound, of the Malayan; becauſe, when I required them of him, he told me, that he had ſent them unto you. And I would fain have our accounts ſtand exact, that none of your copies may be embezzled. In the incloſed paper, that which hath the line drawn by it in the margin, is added over and above what was in the former. I would willingly keep in the word Director in the addreſs, if you think fit; and then the alluſion to it in the epiſtle will be more perſpicuous. And Committee alone ſeems not to be a word of ſo good a ſound. But however I ſhall do what you think fit, as ſoon as I receive your next, wherein you will give full inſtructions in this and all other things, to,

SIR,

your ever obliged and

moſt humble ſervant,

THO. HYDE.

Oxon, October 16, 1677.

SIR,

I HAVE now at laſt gotten the things printed, and have ſent them to you in a packet by Mr. *Moor*'s waggon, where your ſervant may find it on Thurſay morning, at the *Saracen's-head* near *Newgate*.

I HAVE ſent, in parcels, one hundred and fifty of the half ſheet reprinted for the one hundred and fifty books, which I ſent up to you unbound; and the like number of the epiſtle to be prefixed to the ſame books. In another parcel I have incloſed one hundred of the epiſtle, and one hundred of page 9 and 10, which may be paſted and inſerted into the books already bound, in caſe they are not yet ſent away. And there is one of each for the ſingle book, which you had at firſt. In a third parcel there are twenty five of the epiſtle, and the like number of the half ſheet, to be inſerted into the ſupernumeraries; and ſo the former half ſheet, where is the mention of *New-England*, may be caſt away; and ſo alſo in the reſt of the unbound books. I am ſorry to hear, that the buſineſs of the merchants is at a ſtand; but I hope they may write to the reſt of their company, and get their conſent by letter. We hear, that Dr. *Buſby* will give two thouſand pounds towards the erecting of a congregation *de propagandâ fide*; and we are beginning to conſult of ſetting aſide a hall in *Oxford*, to bear the name of *collegium de propagandâ fide*, and ſome propoſals will be drawn up and offered to conſideration: of this you will hear more from the biſhop of *Oxford*, who will be in *London* about the end of this month, or the beginning of the next. I think it might be convenient, if you would pleaſe to preſent to the biſhop of *Canterbury* and of *London*, either each of them an entire book, or at leaſt the epiſtle and preface. And ſo alſo to the ſecretaries of ſtate, if you think fit. And I believe the deſign will take; of which I am very glad; for I have been often contriving how to find out patrons for ſuch a deſign. I ſuppoſe, that at the factories in *Eaſt-India* there are vocabularies for teaching the Malayan tongue to merchants and interpreters: if any ſuch could be procured, it would do us good ſervice. I have been told, there is a merchant at *Kenſington*, who hath ſome ſtrange books, with which he uſeth to baffle all people, who come near him. It were to be wiſhed we could know what thoſe books are. In the mean time I remain,

SIR,

your ever obliged

friend and ſervant,

T. HYDE.

Oxon, Thurſday, November 29, 1677.

SIR,

THIS day the biſhop of *Oxford* is to preach in *London*, at the anniverſary meeting of the miniſters ſons; and being in *London*, there is no doubt but he will come and viſit you. My preſent occaſion of writing is to acquaint you, that I have lately diſcourſed with him about Dr. *Buſby*, and he doth ſeem to doubt, whether his promiſe will be made good or not. But, however, I could wiſh, that you would be pleaſed to take the pains to viſit Dr. *Buſby*, and let him know, that you have heard ſomething concerning his intention of contributing a ſum of money towards the raiſing a fund for the propagation of the goſpel; and ſo you will quickly find, whether he will be likely to hold to his

word, or not. I ſuppoſe my lord of *Oxford* will ſolicit Mr. *Daniel Sheldon*, and ſome others of the merchants, who (upon his diſcourſing with them, not long ſince) did ſhew great willingneſs to have ſomething ſet apart yearly for the propagation of the Goſpel.

MY friend, Mr. *Fraunce*, whom you formerly procured to go chaplain to *Bombay*, is dead half a year ſince. He told me, in one of his letters, that he had gotten for me the *Zundavaſtaw*, and ſome other books, in the Eaſtern languages: but now I fear they will be loſt, unleſs any friend could direct me how to recover them. I ſuppoſe it muſt be by writing to the governor of that factory, to whom I am not known.

SIR, at your leiſure I would intreat you to be pleaſed to inform me what diſagreement there is between vinegar and nitre, becauſe of Proverbs xxv. 20. "As he, who taketh a-"way a garment in cold weather, and as vi-"negar upon nitre, ſo is he, who ſingeth ſongs "to an heavy heart." It ſhould ſeem, that their nitre was natural, and therefore perhaps different from ours, which is artificial.

IT was probably the ſame nitre mentioned by the prophet, "Though thou waſh thee-"ſelf with borax, and uſeſt much nitre, yet "ſhall not thine iniquities be cleanſed, ſaith "the Lord." For though the ordinary tranſlation, inſtead of borax, reads ſoap, yet I think, that borith ought to be tranſlated borax; which is alſo a ſort of ſalt, much of the ſame nature with nitre, and therefore not unfitly joined with it, for the very ſame uſe of cleanſing, which is proper to all ſalts. And I my ſelf have fetched a ſpot out of my garment, by wetting the place, and laying nitre upon it, and rubbing it hard on. But I cannot find what is the oppoſition between vinegar and nitre. And therefore I beg your information, to,

SIR,

your obliged ſervant,

THO. HYDE.

IF you can inform me, how I may ſend a letter to *Tangier*, it would be a favour unto me; for I have ſcarce been able to make a letter arrive ſafely thither.

Oxford, New-years-day, 1677.

SIR,

I LATELY met with Dr. *Maſters*, the chancellor of *Exeter*, concerning whom I lately wrote unto you, that he had a brother reſiding at the Fort of St. *George* at *Matrepatan* in *India*, who is governor of all our factories thereabouts, and that he might be ſerviceable to you. He tells me, that he was twice at the Eaſt-India houſe, in hopes to have met you there; and that he hath ſent to his brother ſome of the prefaces, which I gave him; and that he doth not doubt, but that his brother will be moſt ready to recommend the buſineſs of the propagation of the Goſpel to thoſe chaplains, who are upon the factories, the doctor having written to him to that purpoſe at my requeſt; ſo that if you ſhould think fit to ſend any books thither, he will manage them to the beſt advantage: and he will in the mean time get for us ſome helps for the Malayan language.

I HAVE been told, that there is a merchant at *Kenſington*, near *London*, who uſeth to puzzle all people with a ſtrange book. I wiſh we could find any means to know what it is.

I MAKE bold to requeſt your advice in the behalf of two friends of mine, who are perpetually troubled with a great heat in their blood, and biting and gnawing in their ſtomach and guts, and it hath been ſo for three or four years: and I cannot gueſs what ſhould be the cauſe, unleſs perchance by the often taking of mercurius dulcis. For by the advice of ſomebody or other, they uſed always, when they took any purging pills, to add ſeveral grains of ſweet mercury, to make it ſtrongly purgative. Wherefore I would entreat to know your opinion, whether mercury may poſſibly have any ſuch laſting effects, as gnawing and excoriation of the ſtomach, and putting a conſtant heat into the blood? And if ſo, then I would intreat you to inform me, if you know any thing may correct and check that corroding quality; for the perſons are my near relations. The beſt thing they have yet found, is ſallet-oil, which being drank, gives preſent eaſe and cooling, even as water doth extinguiſh a fire: but it doth not remove the cauſe. They have tried many other things, but in vain; and purging doth no good. If they eat or drink any thing, which is ſalt or naturally hot, it puts them to pain and griping. One of them had the corroding ſharp humour once beginning to break forth upon the outſide of the ſtomach, and then had eaſe: but it unhappily ſunk in again, and then the pain returned. I hope you received my account of *Lullius*'s books. And ſo wiſhing you a merry Chriſtmas, and a good new-year, I remain,

SIR,

your ever obliged

friend and ſervant,

T. HYDE.

Oxon, Feb. 17, 1677-8.

SIR,

I HAVE here incloſed a tranſcript of the life of *Raymund Lullius*, according to two authors, which is all we have concerning his life. You may allow the tranſcriber what you pleaſe. Here is alſo an account of the number of leaves in all, which we have of him, either printed or manuſcript; by which any body may eaſily make an eſtimate of the number of ſheets. I humbly thank you for your kindneſs to the Perſ-Armenian. I have

alſo

alſo ſhewed thoſe worthy gentlemen of *Holſtein*, what could poſſibly be done in ſo ſhort a time as their ſtay was at *Oxford*. I ſhewed Dr. *Sall* that part of your letter, which concerned him, and he returns you his very humble ſervice with many thanks, which he deſired me to do for him, that ſo he might not give you the trouble of a letter for that alone.

I THINK I remember you told me, that you had found ſome of my papers of notes upon the ſcripture: what you have found, I would intreat you to be pleaſed to ſend unto me, and the reſt as ſoon as you can light upon them; for I would as faſt as I can review them, and try what thoſe with ſome others of like nature will amount to. Thoſe which I ſent you were upon the beginning of Geneſis and the beginning of St. *Matthew*. This is all at preſent from,

SIR,

your deeply obliged, and

moſt humble ſervant,

THOMAS HYDE.

Publick Library, *Oxon*, Aug. 2, 1678.

SIR,

UPON the information from my worthy friend Dr. *Marſhall*, how well the archbiſhop of *Canterbury* and other great perſons did reſent the buſineſs of the Malayan and the propagation of the goſpel thereby, I made bold lately to trouble you with a letter about it, intreating alſo the Eaſt-India company might be a little farther ſtirred up in that matter. But my preſent occaſion of writing to you, is to inform you, that a country gentleman, who came to *Oxford* laſt night, reported, that the miniſter of *Stalbridge* is dead. And if the report be true, and the place be void, I humbly and earneſtly intreat you to be pleaſed to remember me, and favour me with the next preſentation, which will be a making to me for ever. And then I ſhall not have need of the library, nor of any thing elſe. I have been told by ſome perſons, who live not far from *Stalbridge*, that your ſteward uſed ſome dealings laſt time, which I am ſure you would not allow of, if you had known it: and I only give you an hint of it, that ſo you may prevent him for the future. When I ſhall have any occaſion to wait upon you, I ſhall acquaint you with more particulars about it. In the mean time hoping for your favour, I remain,

SIR,

your ever obliged, and

moſt humble ſervant,

THO. HYDE.

I HAVE a friend gone this day towards *Dorſetſhire*, who will ſpeedily give an account by the poſt, whether the information about *Stalbridge* was true or not.

Oxon, December 9, 1679.

SIR,

ACCORDING to your deſire, I have conſulted the natural hiſtory of *Mexico* by *Francis Hernandez*, and I do not there find any mention of the Jeſuit's powder not under any name or title, which I could imagine fit or probable to be ſearched: ſo that I do conclude, that there is not any thing of it. But I found there another antifebrific plant, the deſcription whereof I have here incloſed, ſuppoſing it might be grateful to your friend, to know any thing of the ſame nature with the thing he ſearcheth for. I have alſo conſulted Dr. *Moriſon*, who doth not know any thing about the plant or tree, of which the Jeſuit's powder is made. As for *Andreas Solea*, we have not any thing of him.

As for the copy of the letter out of *Eaſt-India*, I think the ſubſtance of it may without prejudice be ſhewed to any body, if you pleaſe to let your man tranſcribe a copy of it, omitting the name of the author at the beginning, and the ſubſcription of the Fort St. *George* at the latter end. And the ſame favour I begged of the biſhop of *London*, in which, I hope, he will gratify my requeſt, although he hath not ſent me my anſwer; neither do I hear any thing of his receipt of the Malayan goſpels, which I ſent unto him: but I hope the carrier was careful to deliver the book. If it comes into your mind, when you next happen into his company, I humbly intreat the favour, that you would pleaſe to know of him, whether the copy of the letter from *India* came to him or not? I am not certain of any occaſion, which may bring me up to *London* this winter; and the roads are dangerous, for this very week the *Oxford* waggon and coach were both robbed upon *London* road, and laſt week there were ſeveral robberies committed upon people going to *Woodſtock* fair, and near *Abington* one killed, who was heard to cry out murder, and by the track of his blood down to the waterſide, it is gueſſed his body was thrown into the river. And this laſt week we had a young ſcholar, a ſervitor, murthered in *Baliol* college, in his own chamber, by a townſman, who formerly had been a dragoon, now a taylor. He by his acquaintance with the ſcholar came to know, that he had a parcel of money ſent to him by his friends, in order to the taking of his degree: whereupon this taylor borrowed an hatchet, and pretending to give a viſit to the ſcholar, while he was gone down to the buttery, attempted to break open his ſtudy: but the ſcholar coming up again ſooner than he expected, and ſo finding him in the fact, the taylor grew reſolute and deſperate, and with the ſame hatchet killed the ſcholar, cutting him about the head and face, and afterwards carried away his money, and his linen, which was after found upon him with the mark of the ſcholar's name; and it is found of whom he borrowed the hatchet, which was found bloody;

and the taylor being apprehended, hath confeſſed all things. But I have treſpaſſed upon your patience, and therefore I beg, that you will pardon,

SIR,

your moſt affectionate,

and humble ſervant,

THOMAS HYDE.

Incloſed in the preceding.

Franc. Hernandez, Hiſt. rerum Mexicanarum, Lib. IV. *cap.* 21.

De Ytzticpatli frutice febrifugâ.

YTzticpatlis, quem alii Teçonquilitl vocant, frutex eſt radicem fundens craſſam et longam, intus candentem teneramque, plenam ſucco, et ex eâ ſtipites purpureos; folia in plures cuſpides diviſa, et has ipſas interdum ſinuoſas quoque. Florem candentem ac parvum; et fructum rotundum, Ponticis nucibus penè parem. Naſcitur in collibus Hoitzocenſibus. Radix dempto cortice, qui impenſe refrigerat, in lævorem redacta, adverſus febres ſolet devorari. Jus decocti ejus, loco aquæ fontanæ aut fluvialis bibitum, eundem uſum præſtat, præter quod calidas quaſvis intemperies emendat ac corrigit. Nec eſt planta ulla apud has gentes, quæ in extinguendo calore, majori in pretio habetur, aut poſſit huic aliquo modo comparari.

After this deſcription, are added theſe notes.

Ad geranium fortè pertinet hæc planta: ſed repugnat radix tenera ſucco plena, quæ obſcurè rubet, folium ferè cannabis. Caules etiam rubent: fructus nodo concluſus non conſpicitur.

Exponere hîc libuit hanc quoque Malvaceæ, ut videtur, earum regionum imaginem, cui quamvis in autographo nomen inſcriptum non ſit, à nonnullis tamen affinis prædictæ Ytzticpatli cenſetur: folia quidem ſunt Geranii, flos ex alâ pediculo longo inſidet. Calix magnus fere caſtaneus, flos luteus, pallidus, radix craſſa.

BY this you ſee, that there is *Ytzticpatli ſimpliciter ſic dicta*; and another ſort called *Ytzticpatli Malvacea*; both which have their icones or braſs cuts expreſſed. You may alſo obſerve by the deſcription, that this is the only plant among them, which cooleth the blood, and is good againſt fevers: and that therefore probably the other plant, of which the powder is made, is not to be expected in theſe parts.

Oxon, July 14, 1683.

SIR,

I AM aſhamed, that I ſhould be ſo long in acknowledging the receipt of the book of the China pulſe. But if I had written ſooner, it muſt have been an empty letter nothing to the purpoſe, becauſe I could not till within theſe few days get the judgment of a perſon, which I much deſired, who is an ingenious phyſician in our univerſity. He told me, that he had heard ſuch great things of the Chineſe's ſkill in feeling pulſes, and had read in Dr. *Voſſius*'s *De Viribus Rhythmi* ſuch a mighty character of them upon that account, that he expected to find very great and uſeful things in this book, as being their oracle, from whence all their phyſick (eſpecially the diagnoſtick part) was deduced. But he was extremely deceived in his expectation, there being little in it but an heap of irrational directions; and indeed could not be expected to be much otherwiſe from a people wholly ignorant of anatomy, which can only give light in this philoſophy. For if they miſtake the diſeaſe, they have no way to rectify themſelves, ſince by the cuſtom of the country they muſt not diſſect the carcaſe, and ſo diſcover their miſtake. Yet they have luckily hit upon ſome things, which are very pretty: as firſt, they ſaw the neceſſity of a circulation of the blood before ever the Europeans dreamed of it, *viz.* four thouſand years ſince; but their account of it is ſomewhat monſtrous. Only herein they have hit pretty right, in that they ſay circulation begins at the lungs, and ends in the liver, which is ſomething agreeable to the truth. Their circulation is performed fifty times in twenty four hours, or twelve Chineſe hours. But why? Becauſe the heavens, which they divide into fifty houſes, are turned about in that time. For they have a ſtrange fancy of comparing the microcoſm with the macrocoſm, and thence fall into a thouſand errors. 2dly, They have one rule in feeling pulſes very rational, not much obſerved amongſt us, *viz.* an accurate obſervation of the proportion betwixt the pulſe and reſpiration, of which you may ſee a critical account page 16th and the 79th.

NOTHING can be more abſurd than their rules in judging by pulſe. For why ſhould the ſun, and moon, and the three pulſes of each hand, be correſpondent to the three regions of the body? And then it is a wonder they take no care of the brain, no pulſe being allowed to diſcover its diſorders, though even the pericardium be reckoned amongſt the principal viſcera. Hence, I think, I may boldly infer, that their ætiology is horribly ridiculous.

SOME tells us, that the Chineſe without aſking one queſtion or inſpection of ☐, only by the pulſe will infallibly diſcover any diſeaſe: and thoſe [*Voſſius*] who aſſert this, do hence take occaſion to expoſe the ignorance of European phyſicians. We have indeed ſeveral ſtories of this nature, but how true, I know not. But whatſoever empirics they are, I am ſure they are no philoſophers. That the doctrine of pulſes may be improved, is very certain; partly by feeling the pulſes of ſeveral parts of the body (for if the circulation of the blood be unequal, either by obſtruction, inflammation, *&c.* in any part, the pulſe muſt needs thereabout be briſker and ſtronger) and partly by obſerving, whether it be hard or ſoft, *&c.* which ſeems to depend upon the conſtriction or relaxation of

the nervous coat of the arteries, whence the indoles and temper of the ſpirits may be found out. But I have not time to inſiſt on theſe things at preſent. I ſhall only add a pretty odd reaſon, which the Chineſe have againſt phlebotomy, which they wholly condemn, *viz.* As hot water is not cooled by taking away part of it, but by pouring cold water into it; ſo is it in the blood. Thus I have in brief given you my ingenious friend's opinion upon it. He had not time to make a full and exact obſervation of every thing.

HERE alſo comes to you a tranſlation of that tract of yours, which you preſcribed, ſhould be begun upon as a ſpecimen, to try how the tranſlator could deal with your chemical and philoſophical matters in Latin. If he hath not done all things according to your deſire in this ſpecimen, be pleaſed to give us farther directions, which will ſerve for future procedures of this kind. For Mr. *Waſe* hath ſo great a command of Greek and Latin, that he can manage the ſtyle, how you will pleaſe to have him do it. And ſo when he once knows, which way you like beſt, he will be ſure to follow it. He followed the quarto edition of your tract; and therein page 37, he prays you to examine, whether he hath done right about the conſtruction of double concave glaſſes, page 48. he doth not fully comprehend what you mean by tin hour-glaſſes; but he hath tranſlated verbatim. He prays you would pleaſe to conſider, whether there be not ſome miſtake in your Engliſh, pag. 16. where you range gravity firſt amongſt the more, and immediately after amongſt the leſs catholick affections of matter. He deſires to know, whether he muſt follow the known terms of chemiſtry in Greek words, or rather turn them into Latin? As pag. 4. whether for ſo obvious a phænomenon, he ſhould ſay, *Rem tam obvium*, pag. 7. of that ſtrange and unexpected phænomenon, *id areani omnium opinioni refragantis*. Page 16. Springineſs, *elaſticitas*, or *elaſtica vis*: query whether not rather *tenſio* or *tortio*: for in Greek *elaſticitas* properly imports only ductility. He deſires to know, whether you permit him to depart from the abuſes of Greek words, *viz.* whether for *Diaphanus, a, um*, of a falſe declenſion and analogy, you permit him to uſe *Diaphanes* and *Diaphanôn*. But I ſuppoſe in all theſe and ſuch like things, you would rather he ſhould ſtick to the received words, which are beſt known in chemiſtry. And therefore when he hath your directions once, he will know how to go on always.

THE tract tranſlated made forty nine pages in your Engliſh in quarto, which makes ſix ſheets and one page. So that at the rate you propoſed of ten ſhillings *per* ſheet, it comes to three pounds. Dr. *Watſon*, a phyſician of *Dundee* in *Scotland*, as he paſſed through *Oxford* two months agone, preſſed me hard to know ſome ſecret medicine, which you told him I had formerly imparted to you out of ſome Arabick book: but he could not tell me what it was about, and ſo I could not recollect what it was, nor where I had it. And I promiſed him to write to you, praying you would tell me what it concerned, that ſo I might retrieve it for him. Wherefore if you can pleaſe to mind me what it concerned, he will be mightily pleaſed. And now having been ſo tedious already, I ſhall not detain you any longer than to profeſs myſelf,

SIR,

your ever obliged, and

moſt humble ſervant,

THOMAS HYDE.

Queen's-College, Oxon, Feb. 24, 1683-4.

Good Sir,

I RETURN you my moſt humble thanks for your hiſtory of human Blood, which I received of Mr. *Davis*, together with another copy for the publick library, both bound. I doubt not but to receive much both pleaſure and ſatisfaction in the reading of it. I remember you were pleaſed to tell me, that you were about an hiſtory of the Air, which will alſo be a deſirable and very acceptable variety, whenever you ſhall think fit to favour the world with ſo curious a treatiſe by ſo able an hand.

Now that the ſevere weather is gone, and ſtudying weather begins to come in, I was in good hope to have done ſomething in my ſtudies: but our curators of the library have deviſed ſome new troubles for me to loſe my time, and rob me of it. So that I muſt only wiſh for ſuch a condition, wherein I might have quietneſs and ſome tolerable command of my time, ſo as to be able to call it my own, and not be a ſlave to other men's humours. I have made conſiderable progreſs in notes upon the ſcripture, and the hiſtory of the kings of *Perſia*, and the religion of the old Perſians, and divers other ſubjects of the like nature: but enjoyment of my time and of quietneſs (the loſs of which I deplore) muſt bring them to perfection. I will not now treſpaſs upon your time any farther, than only to ſubſcribe myſelf,

SIR,

your ever obliged, and

moſt humble ſervant,

THOMAS HYDE.

Queen's-College, Oxon, Sept. 23, 1684.

SIR,

I HAVE received of Mr. *Davis* two copies of your book concerning the poroſity of bodies, for which I moſt humbly thank you, and for all other your favours. As for the buſineſs of the hoſpital, our biſhop tells me, that ſuch a thing is intended; but it is as yet merely in propoſal, there being nothing done

in order to it. There muſt firſt be ground purchaſed, and then a building raiſed, and then by temporary ſubſcriptions of well-diſpoſed perſons to maintain ſome number of ſick and lame people. Perhaps about a year hence, we may be able to tell you more about it; for I do not perceive any thing likely to be done in it ſuddenly. As for the Malayan grammar of Mr. *Mainſtone*, Dr. *Marſhall* is not now in *Oxford*: but the biſhop tells me, that it is a pitiful trifle, not of any worth. However when Dr. *Marſhall* comes home, I will diſcourſe with him farther about it. What I requeſted of you to the counteſs of *Rocheſter*, I humbly remind you of it: a general character and recommendation to favour will be ſufficient at preſent. I remain,

SIR,

your moſt obliged,

and ready ſervant,

THOMAS HYDE.

Queen's-College, Oxon, March 21, 1684-5.

SIR,

I HUMBLY thank you for your letter, giving me an account of my miſinformation about Mr. *Rich* and *Stalbridge*. And theſe my thanks I had ſooner returned, but that I waited to get a ſight of *Maimbourg*'s book, which I could not light upon till within theſe three days. I peruſed part of it my ſelf, and communicated it to a judicious friend alſo to peruſe it. And we find, that in his preface he owneth, that the deſign of his book is to remove thoſe obſtacles caſt in the way by the rigid part of the church of *Rome*, which hinder thoſe of a different perſuaſion from joining with them: and this he doth in order to ſerve the king of *France* in the deſign of uniting all the ſubjects into the ſame opinion, and bringing them all to the church of *Rome*. And in order to this, he denieth the pope's infallibility, and his ſupremacy in temporals, and his indirect ſupremacy (if I rightly remember) whereby he hath power over princes, ſo far as to ſerve the occaſions of the church (as the Jeſuits contend) though they cannot give him an abſolute and direct power over them. And he alſo makes the pope inferior to a general council. And theſe things do much eclipſe the power of the pope, who (as I am informed) did therefore excommunicate Mr. *Maimbourg*. This is the matter of fact: but if you would know any thing farther, as what inferences may be made from it, or any thing of that nature, be pleaſed to give me an hint of your mind in any particulars, and I ſhall give you the beſt information I can. But as yet I have not heard much ſaid of it.

As to what you once told me about papyrus, that it ſeemed to have a kind of groſs thready grain, I have ſince lighted upon a piece of the ſame matter, which I find is not papyrus, but the leaf of a certain kind of Indian palm, with leaves as broad as a buſhel, out of which they cut long narrow ſlips, and write upon them ſometimes with a ſharp iron-ſteel, and ſometimes with ink, and that in the language of ſeveral of thoſe countries.

BUT about the true papyrus, I am as yet unreſolved. When I can ſerve you in any thing, be pleaſed to favour me, by giving ſo good an opportunity to him, who is always moſt readily and freely,

SIR,

your ever obliged,

and moſt humble ſervant,

THOMAS HYDE.

Publick Library, *Oxon*, July 26, 1687.

SIR,

THE bearer hereof, the Chineſe, hath been with us at *Oxford*, to make a catalogue of our Chineſe books, and to inform us about the ſubjects of them. We have ſome of *Confucius*'s books; but moſt of what we have is phyſick. He is extremely well verſed in his own language, having ſtudied it many years, and alſo *Confucius*'s philoſophy, which he doth not praiſe. He is a very good-natured man, ſtudious and induſtrious, and ſober. His Latin is a little imperfect; but it is well he hath any Latin; for before him there was never but one (who is dead) that underſtood any Latin. And now this is the only man left. I have made what uſe of him I could in a few days, loſing no time ever ſince he hath been with me. He tells me, that in his province of *Nankin* (*i. e.* the ſouth-court) they have but two months of winter, and very little ice or ſnow. The temper of the clime is much better than *England*, only hotter: but about *Pekin* (or the north-court) it is cold enough. You may make a ſhift to underſtand him, though he ſpeaks but imperfectly. He was very deſirous to be recommended to your favour and friendſhip by,

SIR,

your ever obliged

and moſt humble ſervant,

THOMAS HYDE.

HIS name is *Michael Shin fo-çung*, whereof *Shin* is the name of his family, and *fo-çung*, *i. e. felicitatis radix*, is his own name. It is the manner always to put firſt the name of the family, as *Cung fu-çu*, where *Cung* is the family name, ſignifying *foramen*, nothing to the purpoſe: but *fu-çu* ſignifies *magiſter*.

SIR,

Publick Library, *Oxon*, Octob. 25, 1668.

SIR,

I HAVE conſidered, that if you would have me to do any thing in the Malayan language, it is abſolutely neceſſary, that I ſhould be furniſhed with all ſuch helps as can be found. Now thoſe helps, which are found, are written in the Dutch language, which I do not underſtand. We have in Dutch and Malayan a grammar and two vocabularies, which muſt of neceſſity be tranſlated, if you would have me do any thing for you in that language, we being deſtitute of fit helps for it. And therefore I would gladly know by the next poſt, whether you will be pleaſed to be at the charge of paying for the tranſlating of them, which being but thin books, cannot coſt much. The reaſon, why I would have ſuch a ſpeedy anſwer, is, becauſe we have now with us a man, who is able to tranſlate them, who will in a week's time be gone from us, unleſs I can ſet him upon it preſently. And he being a grammatical and critical man, I perhaps may not find ſuch another.

I ALSO intreat, that you would be pleaſed to haſten the 3 l. 11 s. 6 d. which is due to the poor letter-founder, he being in great want of it. Yeſterday the biſhop of *Wincheſter* returned to *Oxford*, and this day he is to readmit the preſident and fellows of *Magdalen College*. And I remain,

SIR,

your obliged and

humble ſervant,

THOMAS HYDE.

Publick Library, *Oxon*, Dec. 29, 1688.

SIR,

THIS is to acquaint you, that I long ſince received of Mr. *Bartlet* the money due to the letter-founder, who through ſeveral ſickneſſes, and the burden of many children, and want of work during this time of troubles, is in great want; ſo that unleſs we can find him ſome work to help him, he muſt preſently miſcarry and run away from us; for he hath five ſmall children, and not one jot of work or money to maintain them. I my ſelf have contributed ſomething towards his maintenance, becauſe he is the life of all our printing deſigns. And though it is an ill time to propoſe any thing of charge, yet I muſt take the freedom to acquaint you, that if you deſign any thing ever to be printed in Malayan, it is abſolutely neceſſary to preſerve this man in *Oxford*; otherwiſe all you have done already is loſt. For there are ſeveral other things for the Malayan to be cut and caſt, which muſt be done in *Oxford*, where I am preſent, to give direction; for at a diſtance nothing of that nature can be done.

WHEREFORE I have lately peruſed the Malayan grammar, and conſidered as accurately as I can, what more will be wanting, in caſe any thing is to be printed in the Malayan character; and upon conſideration I do find, that thoſe things, which are farther yet to be cut and caſt by the founder, will amount to about ſix or ſeven pounds. The ſum is not great. Now if, for the preſervation of this man, you will be ſo kind as to ſet him on work, now, at this time, it will be both a great act of charity towards the maintenance of his poor family, and alſo help you to obtain the pious end of perfecting your Malayan deſign, which is yet imperfect, and muſt be loſt, unleſs this man is preſerved in *Oxford*.

AND I muſt farther add, that if, upon the grounds and reaſons abovementioned, you do think fit to ſet him preſently on work for the completeing of what is yet wanting, you muſt pleaſe to ſend down ſix pounds now preſently, beforehand, becauſe of his preſſing neceſſities; and for your ſecurity, I will take of him ſome certain pledges of double the value, until he ſhall perfect and complete ſuch things as you yet want, equal to the value of that ſum, which you ſhall ſend to me.

I SHOULD not propoſe this to you at ſuch a juncture of affairs, but that I do think the preſervation of ſuch an artiſt with us to be abſolutely neceſſary to all literary deſigns, and particularly that of the Malayan; and it is alſo the ſupporting of a parcel of fatherleſs children. If you intend the thing ever to be done, it is but doing it now a little ſooner. And it is not given, becauſe he will do work equal to the money. And therefore I hope you will be pleaſed to pardon this earneſtneſs of,

SIR,

your affectionate

and humble ſervant,

T. HYDE.

Publick Library, *Oxon*, Feb. 23, 1688-9.

SIR,

WE have now (God be thanked) cut the punchions, and ſtamped or ſtruck the matrices, and caſt ſuch a parcel of Malayan letters, as might keep within the compaſs of the money you ſent, that ſo I might not put you to any new charges. And the founder remaineth in our debt about ten or twelve ſhillings, which I ſhall leave till another time, becauſe we ſhall probably want ſome few ſorts of ſome kind or other, which cannot be foreſeen, till trial of printing: neither was it poſſible to gueſs at the quantity of letters to be caſt, ſo exactly to anſwer the money, as that there ſhould be nothing over or under.

I FORMERLY acquainted you, that the printing of St. *Luke* and the Acts in the Malayan letter, would make about thirty ſheets, which may coſt the printing near about ſixty pounds.

But

But I take it for granted, that you will not begin upon it, until your affairs are better in *Ireland*. But in the mean time, ſome preparatory care may be taken, in order to it, by getting ſome helps for the more perfect underſtanding of the language; that ſo what I ſhall do for you may be ſolid and authentick. For I find, that the Dutch prints, which we have followed, and which we are to follow, have many literal faults, which I muſt be able to correct, that ſo I may not turn thoſe faults into a Malayan character, and make the thing ſeem nonſenſe to the natives, for whom you intend it. And furthermore, the Dutch way of expreſſing the ſounds of the Malayan words is ſo diverſe in itſelf, and ſo unintelligible to us, that without accurate ſkill in the language, it will be often difficult, and ſometimes impoſſible, from their writing, to know how to put the words into Malayan letters: to the obviating of which difficulty, it would be neceſſary to get ſome vocabulary, where the words are expreſſed according to our Engliſh way of ſounding them. And to this purpoſe it were earneſtly to be wiſhed, that you would uſe your intereſt with counſellor *Jones* of *Lincoln's-Inn*, to procure the Malayan papers of his brother-in-law, Mr. *Mainſtone*, deceaſed, who, when he lived in *India*, had prepared for that language a dictionary, which he intended to print. And the ſooner this were done, ſo much the better, that ſo I may have time to ſtudy the language, and fit myſelf for the buſineſs to be done.

SIR, I formerly made my humble requeſt to you, that you would be pleaſed to beſtow upon me the next preſentation to *Stalbridge* in *Dorſetſhire* in your patronage: for that wicked wretch, Mr. *Rich*, is fled, and never like to appear there again; ſuch have been his groſs and ſcurrilous abuſes againſt the prince of *Orange*, and his adulteries and other immoralities, and his turning papiſt, or promiſing to do it, *&c.* that he hath certainly merited deprivation, and the men of the pariſh are in wait to lay him in priſon, when they can catch him. So that there is abundant matter for his ejection, there being ſufficient proof of theſe things, as ſome of the pariſh do now tell me. So that I do now humbly renew my requeſt of that preſentation; to the obtaining whereof, though I will not plead merit, yet I might hope from you with more pretence than others can, I having formerly done you near a year's ſervice in the printed Malayan, and am ſtill like to do you more ſervice in the ſame language, in which I am ſure there is no man now alive in *England*, who is able to ſerve you beſides myſelf. And I am ſure, that whenever we begin, it will coſt me at leaſt two years pains to bring to paſs the thing, which you deſire and deſign. For beſides my preparatory ſtudies, to accompliſh me for the well doing of that work, the very tranſcribing of ſo much matter into a ſtrange character, will be a long and tedious taſk; and afterwards to correct it at the preſs will be another taſk as great. And ſeeing it is in your power to reward me, without any charge to your purſe, it ſhould ſeem better to give it to me, than to ſomebody elſe, who perhaps will not be ſo able to ſerve both you and the publick. For if I were ſo far enabled, as to ſpare any thing from buying my bread, I ſhould both cut all ſorts of exotic letters, and publiſh things both uſeful and curious, which otherwiſe will never be done, but muſt die and be buried with me. And yet no body will vouchſafe to conſider me, nor redeem me out of this low condition. Be pleaſed to pardon my prolixity.

I HAVE by *Bartlet* at the *Oxford-Arms* in *Warwick-Lane*, ſent a little book wrapped in paper and directed to you; not well remembring, whether I had preſented it to you or not. If he doth not bring it to you on next Wedneſday, you may pleaſe to let your ſervant fetch it on Thurſday. It is about ſome China matters. And I have by me, upon ſeveral other heads, much more of that China learning, which (if any would be at the charge of printing) might perhaps not be ungrateful to the curious. I have incloſed alſo a leaf of an Hebrew book, which I am now printing; of which I told you, that when it ſhould be printed, I would then do ſomething upon the bible. Having none other by me, I was forced to ſend that foul leaf, by which, however, you may make a ſhift to read my note upon *Taprobana*, whereby you may make ſome gueſs at the reſt of the book. Sir, in the above-mentioned buſineſs you may eternally oblige

Your moſt humble

and ready ſervant,

T. HYDE.

Oxon, March 5, 1690.

SIR,

I HUMBLY thank you, for giving me notice of the company's intention of ſending two chaplains into *India*; though that part of *India* will not ſerve my occaſions of learning, there being not about thoſe parts any of the people or books, after which I am enquiring, as I was informed by Mr. *Gifford*, formerly governor of that fort, who did the beſt he could for me, but could effect nothing, for the reaſon aforeſaid. But however I am glad to get *Oxford* men to be employed to that part, becauſe I ſhall find out ſome way, wherein they may be ſerviceable to our univerſity. And therefore I would beg you to be pleaſed to ſecure the two chaplains places for two very fit perſons, whom I have ſought out for that ſervice. And in my next I ſhall give you a more particular account of them.

THAT, which I chiefly deſire (and which would improve the deſigns of learning) is to get a chaplain to *Bombay*, or rather to *Surat*: for partly there, and partly by the frequent opportunities of ſending by the caravans into *Perſia*, he may do very good ſervice. And therefore if by Sir *Joſiah Child*, or any other

intereſt in the company, you can procure me the nomination of a chaplain to the hither parts of *India*, I do humbly beg it of you. To Sir *John Chardin* I would entreat my ſervice may be preſented, I having been formerly known to him, and have ſpoke Perſian with him. He hath formerly ſhewed me ſome of his inſcriptions, of which I ſhall tell you more by diſcourſe, when I can get to *London*. He formerly entruſted me with one or two of them, to his advantage: and I ſhould be glad, if he would pleaſe to entruſt me with the reſt of them to *Oxford*, where I might endeavour the unriddling of them, for his ſatisfaction, as well as mine own; and particularly, I would ſee the delineation of a Perſian king, who is poſited as adoring the ſun and the fire. If I cannot unriddle them, I am ſure none in *England* can do it; there being none elſe (except Sir *John*) who underſtands the modern Perſian, and much leſs any thing of the ancient. The other perſon, who favours my deſigns, I ſhould be glad to know ſome time, when you think it proper for,

SIR,

your affectionate and

humble ſervant,

T. HYDE.

SIR, my eyes being of late troubled with a watery humour (but not painful) eſpecially in the night time, when I lie down in my bed, I would beg the favour of you to tell me the beſt way of uſing eye-bright, and what hurts or inconveniencies are in it; and whether taking of nitre (as my lord *Bacon* did) be of any uſe to that purpoſe.

Oxon, June 11, 1691.

SIR,

I RECEIVED yours with the encloſed paper from Sir *Joſiah Child*, which is very ſatisfactory; and accordingly I ſhall order two perſons to fit themſelves for the ſervice required of them. And in order to it, I would willingly write to Sir *Joſiah Child* myſelf, if I knew where he is at preſent, and how I may direct my letter to him. And therefore I would humbly beg the favour of that information from you. To Sir *John Chardin* I would alſo write, who uſed to live in *Leiceſter-fields*. But in the ſaid paper I ſee a date from *Turnham Green*, which perhaps is now his habitation.

Now ſince I perceive the good inclinations of the company to do ſomething for the ſervice of God and religion, it may perhaps be ſeaſonable to remind them of educating ſome chaplains to be furniſhed with the Malayan language for the propagation of the Goſpel. The deſign was ſome years agon propoſed by the pious biſhop *Fell*, and in a manner agreed to by the company, and I cannot tell by what accident diverted. The propoſal, which the biſhop urged, was, that the company ſhould allow annually twenty five pounds apiece to four young men, who ſhould ſtudy the Malayan for four years, and oblige themſelves to the ſervice of the company, when required to it. And to me the biſhop had ſpoken to be tutor or inſtructor to the ſaid young men in the Malayan language, it being part of his propoſal to them, that they ſhould allow a decent ſalary to ſuch a tutor. This is not proper for me to move, leſt, coming from ſo mean a perſon, ſhould ſpoil the deſign. But it would be very proper for you to preſs it forwards to Sir *Joſiah*, and you are the only perſon to move it. And therefore if you would pleaſe to take the trouble of being a little active in putting it forward, it would be for the glory of God, which you deſigned in your private capacity to have promoted by the help of the Malayan language, if publick affairs had not run croſs to you. Be pleaſed to afford two or three lines to

Your humble ſervant,

T. HYDE.

Letters from Dr. Peter du Moulin *to Mr.* Robert Boyle.

Canterbury, Dec. 28, 1669.

SIR,

TO the ambition of publiſhing my verſes I have added a greater, preſuming to honour them with your name in the front of the epiſtle. I have now ſome copies of them by me, of which in duty I ſhould ſend you the firſt, that appears abroad, and without delay, but that the great froſt puts a delay upon book-binder's work. And truly I would have taken order, that it had been ſent to you from *Cambridge*, where it was printed, but that I would correct ſome important faults with my hand. I might have put off this addreſs to you, Sir, till my other in print had been ready, but that I was afraid you ſhould hear by others of the coming out of the book, either from *London* or *Cambridge*. Be pleaſed, Sir, to pardon all errors, and accept of the forwardneſs of my humble affection, in telling unto the world in print, how really I honour your great worth, and value the love, wherewith you have graced me. One of the prime licenſers of the book, Dr. *Gunning*, would not ſuffer the heroicks in commendation of the Royal Society to be printed with their fellows. It grieves me to ſee a feud between that noble Society and the Univerſities, to which Mr. *Glanvill*'s books have much contributed. Your great credit, prudence, and moderation, may ſtop that growing evil, if any thing in the world can. That honour and bleſſedneſs may attend your piety and virtue for ever, is the prayer of,

SIR,

your trueſt honourer,

and humbleſt ſervant,

PETER DU MOULIN.

MY wife is your humbleſt ſervant.

SIR,

Canterbury, July 3, 1671.

SIR,

I RECEIVED your late encouragements, (which to me are commands) to make the tranſlation of the French king's declarations againſt the proteſtants; and I have by riſing early found time to do it. It is about a fortnight ſince I had done a moiety of it, and there made a ſtop; yet to reſume it, when I have laid up ſome materials for a preface, and made them into ſome form, which afterwards may ripen by me, while I am tranſlating the other moiety. The truth is, Sir, I am ſtung with a jealouſy of God, at the pride, inſolence, and uncharitableneſs of our men of preferment, that unchurch all our churches: and I intend (God aſſiſting me with his grace) to take occaſion of theſe miſeries of our brethren, to make them (for others, that are better Chriſtians than they) ſenſible how criminal before God and man is their inſultation. Handling that argument as a moderate epiſcopal man, that is as myſelf, who yet will forbear to put my name to it, a cuſtom lately begun, which gives ſomewhat more liberty to the writer. When I have done, I intend to put it in your hands, Sir, *ut arbitrio ſtetve cadat-ve tuo*, knowing that I cannot call to council more wiſdom and more goodneſs. That God join to it the bleſſings of bodily health and ſpiritual comfort is the prayer of,

SIR,

your moſt hearty honourer,

and humbleſt ſervant,

PERER DU MOULIN.

THE firſt time, that I aſked a licence to print my Παρεργα at *Cambridge*, Dr. *Gunning* got it upon condition, that the verſes to the Royal Society were put out of the manuſcript.

BUT the licence for the Incrementum, where thoſe verſes are, was got in his abſence.

GIVE me leave, Sir, here to preſent my beſt ſervice to my honourable lady *Ranelagh* and to her noble daughters. The like to them and yourſelf from my wife your moſt humble ſervant.

BE pleaſed, Sir, to burn this letter.

Canterbury, Oct. 1, 1673.

SIR,

MR. *John du Bois*, a merchant dwelling in *Aldermanbury* near the church, to whom I have committed my tranſlation, had promiſed me to bring it to you. But either your abſence from the *Pall-Mall*, or his from the city, have hindered his performance. I have renewed my requeſt to him by letters this week. When he hath delivered it to you, you may be pleaſed to uſe that friend's kindneſs, who hath promiſed to get it printed. Give me leave, Sir, to entertain you with another buſineſs. Mr. *Peregrine Bertie*, who is a member of the Houſe of Commons, told me, that at their laſt ſeſſion a motion was made by Sir *Thomas Clarges*, that I ſhould be ſent for to juſtify that, which I have undertaken in my book againſt *Philanax*, to make good before authority about a deputation of ſome Jeſuits from their brethren in *England* to the *Sorbonne*, and ſo to *Rome*, about their deſign of promoting the late king's death. But that ſome wiſe men of the Houſe would not have me ſent for, till it was known firſt what I could ſay. This put me to a neceſſity to prepare myſelf, that I might not be ſent for being unready; and I have ſet down in the paper, that I ſent to you, all that I can ſay. The like I have given to Sir *Edward Deering*, and may give the like to ſome other parliament-men, hoping, that ſeeing all that I can ſay, they will not ſend for me. You may ſoon ſee, that if I had been ſent for, when I made this offer, I had convincing proofs. But the main witneſs being dead ſince, I cannot convince an adverſary, but perſuade all equitable judges with the clearneſs of my evidences. My buſineſs is now, and with me of all wiſe and pious proteſtants, to look out more intelligences of the behaviour of the papiſts, in two conjunctures; the one about the time of the king's death, the other in 1663, when my book appeared firſt; and the mention of that deputation ſtruck an extreme terror into thoſe malefactors, of whom Sir *Kenelm Digby* was the head. In this important occurrence I do in all humility conſult the oracle of your wiſdom, and crave the aſſiſtance of your love. I have found you ſtored with the beſt intelligences, as in nature, ſo in ſtate, which at this time would be very conducible to,

SIR,

your real honourer, and moſt

affectionate humbleſt ſervant,

PETER DU MOULIN.

IN all humility I give here my ſervice to my honourable lady *Ranelagh*.

Canterbury, Feb. 23, 1673-4.

SIR,

I HAD given order, that a dozen of my books ſhould be ſent to my ſiſter *Claver* for her to diſtribute; and that you ſhould be the firſt ſerved. But I hear, that my ſtationer hath deceived my expectation. What orders I have renewed ſince, I forbear to tell you. But I would be glad to know, whether it was ſent to you, and likewiſe if my honourable lady *Ranelagh* was preſented with one. How it was licenſed, and no imprimatur to it, is a myſtery, which is yet unknown to me. In this happy turning of publick buſineſſes, I conceive, that the tranſlation of the grievances of the French proteſtants might find a

way

way to the preſs. It is yours, as done by your order, and you may do with it according to your wiſdom. We have ſeen here an amazing account of the danger of the Iriſh proteſtants; yet I hope, that the preſent poſture of the Engliſh affairs ſecureth them from a maſſacre, which doubtleſsly had been executed, if the late deſign of the papiſts of *England* had had the intended ſucceſs. Bleſſed be the great keeper of his Iſrael, who never ſlumbereth nor ſleepeth. To that loving keeper I commend you with my hearty prayers, and my honourable lady *Ranelagh*, to whom I give my humbleſt ſervice, and reſt,

SIR,

your moſt real honourer,

and moſt humble ſervant,

P. DU MOULIN.

YOUR dear nephews are well, and give their humble ſervice to you, my wife does the ſame.

To my honourable lady *Ranelagh*, our dear gallants and my wife give their humbleſt ſervice.

Mr. Winthrop *to Mr.* Robert Boyle.

Boſton in *New England*, Oct. 27, 1670.

Honourable Sir,

THE good contentment I had conceived at the arrival of Mr. *John Pell*, in hopes to have received by him the deſired intelligence of your continued health, when he delivered me your letter of June 21 laſt, was ſoon blaſted by his ſad report of your ſickneſs, and am thereupon neceſſarily under clouds of diſconſolate thoughts, until I have the good tidings of your happy recovery. Mr. *Pell* had a good opportunity, at his arrival at *Boſton*, for the eaſier expedition of his buſineſs, meeting a veſſel of *Fairfield*, the place where his uncle had lived; and in that veſſel was one Mr. *John Bankes*, who was appointed one of the executors in truſt by his uncle Mr. *Thomas Pell* deceaſed; and in the ſame veſſel, together with Mr. *Bankes*, had (that very day of his arrival at this town) paſſage hence towards the place of his inheritance, and had my letters with him (I being then occaſionally at this town) to the magiſtrates and others there, for their reſpect and aſſiſtance to him, and their ordering his ſpeedy and quiet poſſeſſion of that, which was his right; and wrote to ſeveral others of the magiſtrates of that colony, by the firſt opportunity over land, for their like favourable aſſiſtance in his concerns, as occaſion might be. Concerning the Indian work, I ſuppoſe there is full information, and good ſatisfaction from the commiſſioners of the colonies, thoſe of them, who met at *Boſton* this month, three or four of them; I could not be with them this laſt meeting, and therefore had not ſo full notice of the preſent ſtate of thoſe matters; but I ſpoke with Mr. *Eliott*, and ſome others, concerned in that work, and am ſatisfied of an hopeful progreſs therein. I ſhall now make bold to acquaint your honour with a ſtrange thing, which happened the beginning of this laſt ſummer at *Watertown*, a place of the *Maſſachuſet* colony, about ſix miles from this *Boſton* in *New England*, and is very certain. There is a large pond of freſh water at that place, in which were ſeveral ſorts of fiſh; and multitudes of thoſe fiſh of all the divers kinds, which were in that pond, ſuddenly died; there were pike, roach, perch, and other ſorts, with eels alſo, beſides very many of another kind, which come out of the ſea in the ſpring thither to ſpawn; there were very many of all of them found dead round about that water, as near the ſhore as they could come; the water growing ſhallower by degrees from the depth of the pond to the ſhore, and the dead fiſh lying very thick in that ſhoal water in the whole circumference thereof, which was great. There be many difficulties, in the conſideration about this, as to any natural cauſe of it. The pond is large (ſome miles about) and of great depth, and a brook running out of it, ſo as it cannot be likely, that the water ſhould be tainted by the multitude of fiſh. I went to the place to ſee it, but it was above a month after the firſt notice of it; there were there divers yet whole, but the bones of many other, and pieces; it was towards evening, and I had not time to view much of it. There were ſome Indians then there; I ſpoke to ſome of them; they had not ſeen (they ſaid) the like there, or in other waters, though there were ſome very old amongſt them; but their apprehenſions were, it might be by the lightning, there having been at that very time, and at that place, great thunder and lightning. I am upon further inquiry about it, and of what particulars have been taken notice of as moſt remarkable; and if any come to my knowledge worthy your notice, may be tranſmitted by ſome other opportunity; and ſhall be bold humbly to crave your judicious thoughts of this thing, whether any natural cauſe can be known; and whether any memory of this age, or hiſtory of former of the like in any lakes in *Ireland*, or ponds, or lakes in other parts of the world, hath obſerved apparent cauſes, or whether only to be looked upon as ſupernatural. Your judgment at your next convenient time will greatly add to the many deep obligations, wherein I am ingaged ever to be in great reality,

Honourable Sir,

your moſt humble ſervant,

JOHN WINTHROP.

Letters from Sir Paul Rycaut *to Mr.* Robert Boyle.

Smyrna, July 2, 1671.

Honoured Sir,

THE fair opportunity, that I have by the bearer hereof, Mr. *Smith*, to kiſs your hands, induces me to put you in remembrance, that you have a ſervant here, who would rejoice and be proud of nothing more than receiving your commands. And though, Sir, my fortune was never ſo favourable, as to beſtow upon me a felicity ſo ineſtimable, as the enjoyment of converſation with ſo excellent a perſon as yourſelf; yet having read your ſoul in your books, I can boldly ſay, that I have often diſcourſed with you at *Smyrna*, and by your helps to contemplation I have entertained dialogues with you, and in fine am concluded under an irreſiſtible principle of loving your virtues, and admiring your knowledge.

I WISH, that theſe addreſſes were accompanied with ſome ſubſtantial account of affairs here, or philoſophical diſcoveries of ſomething curious, and worthy your obſervation: but, Sir, you may be pleaſed to conſider, that I live in *Turky*, and am ſo employed in directing trade and merchandize, and other petty matters annexed to the government of this conſulate, that I am almoſt become a ſtranger to more ingenuous and liberal arts. Howſoever, when I have time and leiſure, I adventure to blot ſome ſheets of paper (as Mr. *Smith* will inform you) with matters of theſe countries, relating to the Chriſtian churches, and to the annals of the Ottoman ſucceſſes in theſe latters years. Whether they may be worth the knowledge or notice of the world, I cannot tell, at leaſt I have this ſatisfaction, that they have been my paſtime in my hours of leiſure, and recreated my mind, when my thoughts have been overcharged with leſs pleaſing conſiderations: but, Sir, no employment can be ſo delightful to me as to be buſied in your commands, nor can I ever be ſatisfied, whilſt I am idle and uſeleſs in your ſervice, who am,

SIR,

your moſt humble ſervant,

PAUL RYCAUT.

Dublin-Caſtle, March 3, 1685-6.

SIR,

YOU might juſtly accuſe me of too long a neglect in not writing to you, conſidering the great concernments you have in this kingdom, and the great intereſt and power your commands have over me. The croud of buſineſs, which preſſed me at my firſt arrival here, gave me but little leiſure to attend to an intercourſe of letters with my friends in *England*; and I was then ſo much a ſtranger to all the affairs of this country, that I was afraid to give any account of matters here, leſt I ſhould have miſtaken in my firſt rudiments,

I AM now become a little better acquainted with perſons, and the ſtate of affairs in this kingdom; ſo that matters, which now come to appear before me, ſeem leſs ſtrange and difficult than at firſt. The account you gave me of the ſtate of this country one day at a private conference together, I have often remembered, and compared with the diſpoſition of this country, and find it very agreeable, and correſponding in all particulars. Nothing hath had a greater influence on the peace of this kingdom, than the arrival of this lord lieutenant, who having declared in council, the ſame hour he received the ſword, that his majeſty reſolved to maintain the act of ſettlement, the minds of thoſe preſent were greatly exalted, and the good news was quickly diſperſed over this whole city, with general ſatisfaction. I am very well aſſured, that never any governor was more welcome here, than this lord lieutenant, who, by his even carriage towards all people, hath ſtrangely gained upon the affections of all parties. Certainly never any man was ever more aſſiduous in buſineſs, nor more indefatigable than he; ſo that I am very well aſſured, that this kingdom and people will be extremely happy and flouriſhing, if his induſtry and methods be not ſtopped, and ſubverted by other meaſures from *England*. I have ſometimes the opportunity to diſcourſe with my lord *Burlington*'s agent, touching his lordſhip's affairs, and have alſo received the honour of two letters from my lord's own hand. I could wiſh I were capable to render his lordſhip that ſervice, which might at his arrival here in *May* next (which he gives us hopes to expect) make me worthy of his lordſhip's favours.

I SHALL ſhortly give you ſome particulars of what we tranſact at our royal ſociety here. I have but once been preſent with them, as yet, being commonly obſtructed by buſineſs; but ſhortly I ſhall endeavour to accommodate my buſineſs in ſuch manner, as that I may more frequently afford them my company. Sir, I deſire you to preſent my moſt humble ſervice to my lord *Burlington*, and be pleaſed to command me in any thing, wherein I may be uſeful to you, who am

Your moſt faithful, and

moſt humble ſervant,

PAUL RYCAUT.

Hamburg, Auguſt 3, 1691.

SIR,

JUST now I received the favour of your letter, with the much eſteemed preſent of a book (called the Chriſtian Virtuoſo) delivered to me by the hands of Mr. *Chamberlaine*. The letter bearing date of the 13th of February laſt,

laſt, was not (as I thought) to be longer laid aſide, or my anſwer thereunto, or my thanks for the book, and your obliging enquiries after my condition and health, to be one moment deferred; for I was impatient of doing both, and eſpecially to let you know, that my returns would have been much ſooner, had your letter come in due time; yet I am ſure it could never come too late, to make me ſenſible of the favour, nor unacceptable by the hands of that worthy gentleman, who was the bearer of it.

I NEED not enquire, Sir, what you are doing, ſince you give ſuch frequent demonſtrations and proofs of your labours, which have enriched and cultivated the minds of mankind with philoſophy and religion. I cannot ſay, that I have as yet read your laſt book, it not being above two hours ſince it came to my hands; but I have delighted myſelf in reading the preface, and in my thoughts on the title, which confirms unto me the truth of that ſaying, that a little philoſophy may make a man an Atheiſt, but a great deal will advance him to the ſtate of a Chriſtian. So that I muſt needs ſay, that you have been very happy in pitching upon ſuch a ſubject.

ABOUT ſix or ſeven months ago I wrote to you, and incloſed the letter in my packet to *White-hall*, which I hope you received. I then, as I remember, told you, that I employed my vacant hours in writing the hiſtory of the laſt wars and troubles in *Hungary*; in which I have lately received great helps by papers, and manuſcripts, ſent me from *Vienna* and *Tranſilvania*, by my lord *Paget*, and other friends at *Vienna*.

THIS work ſerves to keep me from idleneſs, and to fill up my leiſure hours, I mean, as many as I can ſpare from expected and neceſſary correſpondences. In the mean time (I praiſe God) I enjoy a perfect health, in this air, which I eſteem very good and dry, and very agreeable to my natural conſtitution of body: I hope you do the like at *London*, of which the beſt aſſurances I can have, are from your writings, which are the beſt evidences, in my opinion, of health; for great ſtrength of reaſoning, or exalted fancy, can never proceed from a languiſhing body. It would be a great ſatisfaction to me, to hear ſometimes from you, both as to your health, and recovery of your eſtate in *Ireland*, which I am glad to hear is almoſt totally reduced. I ſhould alſo rejoice to hear of my lord *Burlington*, and the welfare of all your honourable family; and to your ſelf I am full of warm wiſhes for your health, proſperity, and long life, being, with all reality,

Honoured Sir,

your moſt obliged,

and moſt humble ſervant,

PAUL RYCAUT.

Letters from Dr. Bernard *to Mr.* Boyle.

Right honourable,

HAVING deferred my journey to *London*, till it pleaſe God to give me another year of life, I account myſelf obliged to premit this humble acknowledgment of the laſt book, and the former favours you have conferred on me, beſeeching the Beſt to bleſs you with the mercies of both worlds, and reward you for the various good you have done in this.

IF any gentleman, amongſt the many that covet to wait upon you, have a deſire to advance the ſtudy of the oriental languages, which open to us the divine word, the treaſure, that Mr. *Huntington* lately brought from the Eaſt, amounting to four hundred mighty volumes, and more, in Hebrew, Syriac, and Arabic, deſerves well the purchaſe, that it will come at, namely, the very coſt of them upon the places in the Levant, being as ſo many pounds ſterling for the ſaid number of manuſcripts, moſt of them in form very large.

THEY are as yet entire, but I fear, unleſs a patron interpoſe, will ſoon be parted, and thereby loſe a great deal of their uſe and profit, which ariſeth from their conjunction, as happens likewiſe to all good things. I commend my humble ſervice to my honoured predeceſſor, the lord biſhop of *Sarum*, who will ſupply the mathematic ſtudy with books to the value of one hundred pounds; and alſo to Sir *Chriſtopher Wren*, whoſe benefaction in the like kind we already uſe, as far as may be, by the leave of *Joſephus*, and the meanneſs of,

Right honourable,

your moſt obliged and

moſt humble ſervant,

E. BERNARD.

I HEARTILY congratulate the honours lately conferred on your noble family.

May 13, 1673.

Honourable and my very good friend,

I MAKE bold to ſend you a ſpecimen of the Arabic proverbs, which Mr. *Scott*, bookſeller, deſired to be made, in order to print the whole, if one hundred copies could be taken off by our friends here (Dr. *Caſtell* promiſing for a like number at *Cambridge*.) In the edition I would, if it be agreeable to the mind of the ingenious, that a ſmart Latin verſion be put to the Arabic proverbs, and then a verbal for the uſe of the ſtudents in that ample language.

MY hours ſpared from mathematics, and my good friends, I chiefly deſign upon the Pſalms, both becauſe of the frequent and deſerved uſe of that holy book, and alſo the remains of ancient verſions and commentaries thereon.

thereon. When I have finiſhed the firſt and ſecond pſalms, I ſhall preſent you with a ſpecimen thereof, which will better explain my intention than I can do at preſent. To this end, there is an Arabic manuſcript in the library of our ſociety at *Arundel* houſe, which hath theſe two things, for which I deſire to borrow it, upon the ſecurity of my honoured collegue, *viz.* a good preface, and the Coptic interlaced, of which I am a mean ſtudent, by the example and encouragement of Dr. *Marſhall*, the worthy rector of *Lincoln-College*. Now I moſt heartily condole with you, and all pious and ingenious men, the loſs of my dear friend and brother Mr. *Smith*, of *Queen's-College*, who was taken away from preferment, as it was approaching him, and is now infinitely more happy. I pray for your health, which is of greateſt moment to all ſolid learning, and its proſperity. I verily believe, that Dr. *Voſſius* will deſerve better preferment from our church, than what he now commences in our habits. Mr. *Frampton* will precede doctor this act, and will (God willing) preach the act ſermon here.

THE reſt of this affair Dr. *Wallis* will better acquaint you with; only I muſt acknowledge, by my own hand, as well as by his aſſurances, that I am

Your moſt humble, and

moſt obliged ſervant,

E. BERNARD.

December 30, 1673.

Honourable Sir,

I AM obliged to you for many favours this decayed year, for thoſe good books, which no ſickneſs could hinder the publick of, for the favour of your laſt letter, and particularly for your good character of Sir *Chriſtopher Wren*, who we wiſh our burgeſs. The voice of the univerſity is not yet certain, becauſe divers perſons ſuſpend till the writ comes down. I hope well on my patron's ſide, and my little credit with ſome friends is now exerciſed.

HONOURABLE Sir, I beſeech God Almighty to give you a happy new-year, good health, and all ſpiritual comfort, and am

Your very obliged

and moſt humble ſervant,

E. BERNARD.

I WISH proſperity to the Royal Society, and deſire to ſerve them.

Oxon, May 1, 1680.

Honourable,

HAVING ſome months experience of this learned Breman, and beſides his ſkill in phyſick, admiring his ſingular knowledge in our tongue, I could not but gratify his ambition of waiting upon you, or rather offer this occaſion for your commands into *France*, whither this gentleman is going. The affairs of this place I concede to my good collegue, to relate to you in preſence, and only claim the honour of profeſſing myſelf

Your much obliged,

moſt humble, and

moſt obedient ſervant,

E. BERNARD.

IN the antiquities I am arrived to *Heliopolis*, where the patron ſaluted his beloved *Joſeph*. The Gallican copies would eaſe my taſk, and not increaſe, but ſhorten the various lections.

Oxon, Oct. 18, *hora vix ſexta*, 1680.

Honourable,

THE great advantage I have received in the converſation of Dr. *Hanſen*, both from his own virtue and ſpirit, and alſo his large intelligence with the more curious and learned of this age, makes me bold to recommend him to your renewed favour and colloquy; yet with the hopes and reſerve of his ſpeedy return with his conduct the excellent count *Coningſmark*, unto this ſeat again, to be farther loved and admired. The health alſo of Dr. *Pocock* and Dr. *Wallis*, your dutiful friends, now buſied or in the difficulties of the holy prophets, or in the ill-tranſcribed harmonicks of *Ptolemy*, I chuſe to mention in this time of epidemical malady, together with the perpetual duty and obligation of,

Honourable Sir,

your moſt obedient,

and moſt humble,

E. BERNARD.

Oxon, January 15, 1680.

Right honourable,

I SEND, with the wiſhes of a good year, my humble gratitude for your aerial noctiluca, which excels other phoſphori, as the phoſphorus of heaven doth other ſtars, or as your writings outſhine the philoſophies of this age, how various, how curious ſoever.

I HUMBLY recommend to your influence the retrieving of the moſt ancient Greek copy of Geneſis, borrowed by the late lord *Stafford*, but indeed a juſt part of the library of Sir *John Cotton*. *Lambecius* ſhews us a like exemplar, in his deſcription of the Cæſarean library.

LASTLY,

LASTLY, I congratulate the honour and advantage done the Society, in your taking the care and preſidence over it, which adds another obligation to the ready ſervice of

Your moſt humble, and
moſt bounden ſervant,
E. BERNARD.

Oxon, February, 24, 1683-4.

Honourable and moſt worthy,

I RENDER you my humbleſt thanks for your treatiſe of that ſtream, by which we all live, and by whoſe inundation not a few periſh.

THIS hard winter hath, and it is its beſt effect, approved another book, you long ſince obliged the ingenious by, of the nature and power of cold, which hath been little underſtood, either by the ancient or modern philoſophers. Pray grant me your good wiſhes, that, with the ſpring, my vigour and intention may return for ſacred and human ſcience, by the grace of the Omniſcient. Wherein, or to what elſe my meanneſs may apply, you may juſtly and eaſily command the obſervance of,

Honourable Sir,
your moſt obliged, and
affectionate ſervant,
E. BERNARD.

Oxon, Sept. 17, 1684.

Right honourable,

THIS gentleman, of great and unuſual learning, is conſcious of the general eſteem and gratitude I bear you: and this letter renders particular thanks for the treatiſe of poroſity, which you lately honoured me with; indeed ſo much the more welcome to my mind, in regard of my conſent with *Hippocrates*; the ancienteſt and beſt profeſſor of the ſalutary art, concerning the perviouſneſs of our bodies, *cribra planè carnea*, to all good or bad afflations of air: which one element doth more to the temperatures and conditions and ſpirit of animals, than all the reſt, not to add your medicine itſelf. For this very rarely and with a circuit corrects the fault and bane of an untoward atmoſphere.

I HAVE adventured to offer you a tranſaction, not for the worth of ought therein contained, as that I might not be wholly empty.

LASTLY, I recommend to you the hiſtory of Sir *Otho Helvig*, from the mouth of this worthy ſcholar; who deſires, that neither his own prince, nor your honour, may ſuffer by the pretences and falſe glories of that knight.

Now I pray for your long and peaceful life, and beg your bleſſing upon your obliged in this univerſity, and particularly,

Right honourable and devout,
upon your moſt obedient
and affectionate ſervant,
E. BERNARD.

Oxon, Aug. 1, 1619.

Honoured Sir,

I HUMBLY entreat you to procure amongſt the Eaſt India merchants a complete alphabet of the Brahmins or Hanſcretan writing, and alſo of the Malabar; which will be a great obligation to

Your humble ſervant,
E. BERNARD.

Alphabetum Hanſcretanum, aut Brahminicum.		*Alphabetum Malabaricum.*
a	The numeral Figures.	a
b		b
c	1	c
d	2	d
e	3	e
f	4	f
g	5	g
h	6	h
i	7	i
k	8	k
l	9	l
m	10.	m
n		n
o		o
p		p
q		q
r		r
s		s
t		t
u		u
x		x
y		y
z		z

I FEAR this writing is erroneous, as well as imperfect; but it is all the printed books will give us.

Honoured

Oxon, Feb. 1, 1690-1.

Honoured and beloved,

AS you have done a good and dutiful ſervice to the Author of all, in tranſferring the attributes of nature, which ethniciſm and ignorance long miſplaced, unto the right and omnipotent cauſe, ſo you perſiſt in honouring the Creator, by carrying all curious and generous minds through the regions of his works, unto the throne of his glory, mercy, and perfections. This is certainly the moſt worthy epilogue and corollary of all the years of your philoſophical contemplations; and adminiſters to me and to thouſands more a freſh and noble argument of the pure condition of our reaſon; that a mind for many and many years converſing with all the varieties of the material world, and trying all the forms, motions, and changes of ſublunary bodies to ſundry advantages of human life, ſhould, as unſatisfied and not pure enough, yet pierce farther unto what is more clear and refined, even than number and analogy, unto the eternal, the almighty, and adorable Spirit, to whoſe grace and illumination you are heartily recommended this recent year, by,

Honourable Sir,
your moſt obliged ſervant,
E. BERNARD.

WHATEVER is againſt reaſon, that is, againſt all poſſible means of arguing and referring, is abſurd and unworthy religion: and what is above reaſon, that is, above and beſides all human traditions, doctrines, writings, and diſcourſes, and the laſt concluſions from theſe, is not to be received, unleſs upon a principle moſt reaſonable and ready, even as our ſight, that is undeniable witneſs; and ſuch is the divine ſcripture, for which God be ever bleſſed. But alas! it is the pride and pazzia of theiſts and ſchoolmen, to fancy that to be above and againſt the right reaſon of mankind, which is above or againſt their ſingle and unimproved intellects.

Letter from Sir John Finch *to Mr.* Robert Boyle.

Florence, Feb. 6, 1667-8. N. S.

SIR,

I AM glad of any errand to convey my reſpects to you, which are ſo great to your perſon upon ſo many ſcores, that I had rather leave you gueſs at them by what they ought to be, than by endeavouring to repreſent them to let you ſee they fall ſhort of what my obligations ſhould render. Sir, I hear from others, how publick a debtor you have made me to your goodneſs; for the wars have not ſuffered me to be ſo happy, as to ſee what you bleſſed this age withal ſince I left *England*: but alas! Sir, a perſon of your value and eſteem (with whatſoever in this world can make a judgment) has diſpenſed a character ſo much in my favour, that nothing of private can ever acquit the obligation, nor nothing of publick can ever make good to the world that belief of me you have raiſed. I confeſs, Sir, having made your great abilities much of my diſcourſe, I have gained ſome reputation abroad of judging aright; and I muſt aſſure you, Sir, that the late pope was very high in your commendations. What the princes of *Italy* think of your perſon, I need not atteſt, ſince cardinal *Leopoldo* declares their ſenſe in ſo frequent admiration of your diſcoveries; and I will aſſure you, Sir, the cardinal gave me but two of his books for *England*; one whereof was for his majeſty, and the other for yourſelf, which he deſired me to convey with expreſſions of ſo much eſteem, that I will leave you to gueſs at the ſincerity of them, by what he owns to the world in print. And now, Sir, I have declared my meſſage, I ſhall for the future beg your audience; and when you are more at leiſure, I ſhall give you the trouble of ſomething to entertain your curioſity at leaſt, by an account of what paſſes in theſe parts; but at preſent time will only permit me to make the promiſe, which I ſhall perform by the firſt occaſion; and with all the devotion the heigth of reſpect can dictate, ever remain;

SIR,
your moſt humble, and
moſt obedient ſervant,
JOHN FINCH.

DR. *Baines* deſires me to preſent you with his moſt humble ſervice.

MY brother will give the cardinal's book he ſent, to whom you ſhall order to receive it.

Letters from the earl of Winchelſea *to Mr.* Robert Boyle.

Eaſtwell, Sept. 10, 1675.

SIR,

I HAVE thought the time very long ſince I had the honour to have waited upon you; my occaſions keeping me here in the country muſt be my excuſe. Intereſt, which ſways ſo much in prince's courts, muſt have weight in the balance alſo with thoſe, that live the moſt remote.

MONSIEUR *de Son* hath made me a moſt excellent engine, that forceth water up to this houſe one hundred foot high, in great quantity, and works without any jarring, or ſhaking, and yet with great force and conſtancy. A deſign of which my ſon *Heneage* will ſend you.

ONE of my ſons I have ſent for *Smyrna* to conſul *Rycaut*, to be bred up for merchandize or navigation. My ſon *Heneage* is to go abroad with me, for I intend with my wife, and a ſmall retinue, for to go into *France* next month. I have a great deal of reaſon to prize my health, which is impaired in this

cold climate, and I go chiefly to recover it. I have ſerved this king and his father ever ſince the treaty in the *Iſle of Wight*, and had ſooner, but that I was too young. It is now high time to think of myſelf and my children; for it is too much to ſuffer twice, once for hating *Cromwell*, &c. and now to be forgot.

I SHALL chooſe one of the beſt airs I can for to live in, and a climate between 42 and 40; one place for the winter, which is warm, and another for the ſummer, which is cool; ſome parts of *France*, or *Italy*, or *Spain*. My intentions are not to ſtay abroad above three years, and in that time I ſhall have my ſon *Heneage* well inſtructed in thoſe three languages, and have ſeen enough. I have cauſe to look well after this ſon, for I loſt my eldeſt firſt in his match, whilſt I ſerved the king in *Turkey*, and at laſt in the wars with the Dutch.

WHEN I ſhall be abroad, if I can ſerve you in any information, or curioſity, you will oblige me in commanding me. I have no intention by theſe lines to put you to the trouble of an anſwer, for I reſolve to wait on you as ſoon as I go to *London*, which will be ſome time this month. In the mean time I wiſh you all happineſs, that am

Your moſt humble ſervant,

WINCHELSEA.

Eaſtwell, Sept. 26, 1683.

SIR,

I RECEIVED the honour of yours dated the 20th inſtant, and am extremely obliged to you for your care of my health. I wiſh it were well enough to do you any ſervice, whereby I might expreſs, how much I value your friendſhip, and how gratefully I receive your love and kindneſs in ſuch repeated inſtances.

I THANK God, in many reſpects my health is of late amended, upon which account I have hitherto delayed my intended journey, in hopes it might have been wholly repaired here; but the ſcurvy in my mouth is ſo inveterate, that I muſt be forced to remove out of *England*, except I would hazard all my teeth, one of them being already ſo looſe, that I deſpair of ſaving it by any means. I deſign to take my journey about three weeks hence, or a month at the fartheſt; and ſtaying but two or three days in *Paris*, to haſten directly to the moſt ſouthern parts of *France*, and perhaps (if I make ſuch diſpatch as to paſs the *Alps* before the 10th of November) I may winter at *Piſa*, which is accounted by the duke of *Florence* to be a very good air at that time of year; but as to this particular, I beg the favour of your advice.

I DO not know, how matters ſtand between *Spain* and *England*, but in my own eſteem, I prefer *Barcelona* to any other place, unleſs I would go ſo far as *Naples*; but neither muſt be thought of, unleſs I had greater aſſurance of civility from the Spaniards, than at this juncture I can propoſe.

WHEREVER I am, I beg the honour of your correſpondence with me by letters: yours may be left with conſul *Ryraut*, to whom likewiſe I ſhall direct mine for you: and if I can do you any ſervice in my travels, you ſhall find me very willing and ready to undertake it.

As to *Muntingius*, what I deſign is for the publick good; I have ſent for the book, and before the extract is publiſhed, I ſhall deſire your approbation.

IF I can make any enquiries abroad, which may be uſeful to you, I intreat you would be pleaſed to ſend me inſtructions in writing; and wherever I come, I will confer with the moſt learned, and beſt experienced in each particular.

BEING indiſpoſed myſelf, I have taken the liberty of an amanuenſis, and hope you will uſe the ſame freedom with me upon any occaſion. I am

Your moſt humble, and

moſt obliged ſervant,

WINCHELSEA.

IF you can direct me where to buy any of that water, which you were formerly pleaſed to recommend for my teeth, I ſhall take it as a great favour.

Letters from Dr. Sall *to Mr.* Robert Boyle.

Chriſt-Church in *Oxford*, Dec. 17, 1678.

Honoured Sir,

I HAVE the honour of yours of the 12th current, and do humbly thank you for your kind remembrance of me, and for helping me to bleſs God for his good providence over me, in leading me to this religious retirement, ſo convenient and neceſſary for me in this conjuncture. I endeavour to make the beſt uſe I can of what time and ſtrength God ſends me, for his ſervice and the common good. My preſent work, commended to me by our chief prelates, is, to reviſe my courſe of philoſophy, controverſial and moral, and the fundamental tracts of practical theology, which in my better age and forces I laboured for my publick lectures, but much more for the future profit of my countrymen; my purpoſe being to deliver to them the ſyſtem of notions belonging to thoſe faculties, approved by the more creditable authors of this age, in a more clear and brief method, than others going among us, avoiding both extremities of a barren ſummary, without reaſoning my aſſertions, and of a confuſed prolix excurſion upon unneceſſary matters; as alſo excluding poſitions oppoſite to true orthodox doctrine, and ſuggeſting foreign errors, which is now my ſpecial ſtudy to ſecure. This much in

due

due obedience to your requeſt for letting you know my preſent tax.

AND whereas you are pleaſed to give me leave to deliver my opinion touching your deſign of reprinting the new teſtament in Iriſh, and how it may conduce to the converſion of thoſe miſerably deluded ſouls; I bleſs God for inſpiring to you ſo holy a zeal, and to thoſe worthies, that join with you therein. And I doubt not but it may conduce highly to the glory of God, good of thoſe ſouls, and credit of our government, if the other prelates and paſtors of Ireland did uſe ſuch endeavours as the good archbiſhop of *Caſhell* does, by communing with the natives, and winning them to hear and read the word of God, and ſpecially if in the college there were a courſe taken for obliging or inticing ſuch as expect to have * * * * * to read and declare the holy ſcriptures in Iriſh, ſpecially the new teſtament, the hiſtorical and proverbial books of the old, together with the old pſalms; of want of which I ſaw good men in both kingdoms give grievous complaints: for me, I am more apt to lament than remedy it. Perſons of your rank and authority, and of your honourable relations, may be more proportionable to effect the remedy; and I would offer my obedientiall concurrence to the utmoſt of my power.

I DO not remember to have ſeen more of the ſcriptures printed in Iriſh, but the pſalms with our common-prayer book in handſom folios for quire, of which I diſcovered a ſet to the archbiſhop of *Caſhell*, and his grace appointed a reading of them in his cathedral. Having lived ſo long abroad, I may not be magiſterial in the *Iriſh* tongue, though by the help of reading I kept ſuch ſtock of it, as enabled me to preach. But this much in general I ſhall inſinuate, that if I were fit to be the tranſlator, of two ends, men may aim at in ſuch a work, the one, of getting the credit of ſkill in the primitive ancient Iriſh, the other, of benefiting common readers by expreſſions now in uſe, I would chuſe the latter. And I do take it to be as unbecoming a ſerious and well meaning undertaker of ſuch a work to uſe obſolete antiquated words, alien from common perception, as may be in a preacher at *Chriſt-Church* in *Oxford* or *Dublin*, to ſpeak now the language of our good anceſtors, the Saxons, in time of king *Edward* the Confeſſor, to get the credit of pure Engliſh; the purpoſe of nature, by ſpeaking, is, to paſs the conception of the ſpeaker to the hearer; to uſe words unſuitable to this purpoſe, is to treſpaſs againſt nature. Let not the grave interpreter caſt off common words, while proper, for derived from Engliſh, Latin, or other civil languages. In a ſerious debate upon this ſubject, with eminent ſpeakers of Iriſh, I made evident to themſelves, that they may not ſpeak much properly in matters relating to philoſophy or divinity, by meer Iriſh words, without recourſe to derivatives. For example, they could not ſhew me one Iriſh word for *blaſphemia*, which themſelves would not laugh at, compared with the meaning of that word in ſchools, *&c.*

I LEAVE to your own better judgment to conſider, whether it may be convenient to face the Latin or the Engliſh with the Iriſh, in two columns of the ſame page, and the Iriſh to be put in Italick character (as was done in a catechiſm I ſaw by *Stapleton* a Romaniſt) which may be a means of learning the Iriſh by Latin or Engliſh, for thoſe of the college and others. The change of characters is but the ſame done by our anceſtors of the Saxon character (which is the ſame with the Iriſh) to that brought in by their conquerors and civiler times: well may the Iriſh bear the like. It were much to be wiſhed, that, by the help of judicious men, the like reformation of the Iriſh orthography ſhould be uſed, as is now going in Engliſh and French, cutting off letters, that are not expreſſed in the prolation; the purpoſe of writing being to repreſent exactly the ſpeaking.

YOU enquire, which is the Iriſh word for a quail? If I have not forgot, it is * * * * * *giarraguirt*, which (alluding to the common haunt of thoſe birds) ſignifies a cornfield-cutter. For a chariot, the ordinary word is * * * * *coſtik*, the ſame that is for a coach. And having ſaid this much, in anſwer to your demand, I humbly deſire my beſt and very affectionate reſpects be preſented to my honourable lady *Ranelagh*, my lord and my lady *Burlington*, my lord and my lady *Clifford*, and all the illuſtrious family, whoſe health and happineſs is the very earneſt prayer of,

Honoured Sir,

your moſt humble

and moſt obliged ſervant,

ANDR. SALL.

Chriſt-College, Oxon, April 5, 1679.

Honoured Sir,

HAVING given account to my lord archbiſhop of *Caſhell* of the pious intention you were pleaſed to impart to me of reprinting the Iriſh teſtament, and deſired his grace to let me underſtand what other parts of the bible he knew printed, or tranſlated to Iriſh for printing, he gave me the notice thereof, which I ſend here incloſed (being a piece of his laſt letter to me) for your further ſatisfaction.

I PRAY be pleaſed to preſent my beſt reſpects to my very honourable and good lady *Ranelagh*, with my moſt humble and hearty thanks for her ladyſhip's pious and noble care in ſoliciting my concerns there. I hope ſo honourable a mediation will avail me, however the preſent concurrence of weighty cares may cauſe a delay. I do not abate in my labours for the publick good for all the want of help I have; for I did not begin, neither (by God's help)

help) will I proceed for any worldly inducement.

IF my lord *Burlington* be there, I beſeech you to preſent my moſt affectionate reſpects to his lordſhip, and to all the honourable family. I continue praying heartily for God's bleſſing upon you all, and am,

Honoured Sir,

your moſt affectionate,

and moſt obliged ſervant,

ANDR. SALL.

Chriſt-Church, Oxford, June 29, 1679.

Honourable Sir,

THIS is to let you know, that if thoſe noblemen, who have hindred my returning to Ireland, promiſing to procure me a competent living here, be pleaſed to continue that good will for me, now an opportunity appears for executing it, whereas the oldeſt of the canons here Dr. *Lockie*, above eighty years of age, is fallen ſick, and, as I hear, without appearance of recovery; his place, or another like it here, is the thing moſt convenient that could be for me, to render me ſerviceable to our church and ſchools, and which the biſhop of *Wincheſter* and other worthy men did wiſh for me from the beginning. I beſeech your honour to continue your noble zeal for me, in propoſing the caſe to my lord chancellor, and to the biſhop of *London*, by my good lord *Burlington*, or yourſelf; whereby I hope their lordſhips will be pleaſed to procure for me that ſettlement and conveniency for ſerving our church, which I am ſo long time expecting.

MY courſe of ethicks is half printed, and promiſed to be finiſhed next month. My whole courſe of philoſophy is ready to follow it. That and more, by the help of God, I ſhall be the better able to perform for the publick good, if this my requeſt be granted. I deſire my moſt humble and affectionate reſpects be preſented to my honourable lord and lady of *Burlington*, to my lady *Ranelagh*, my lord *Clifford*, and all your illuſtrious family, whoſe happineſs *in utroque homine* I heartily wiſh and pray for,

Honourable Sir,

your moſt humble, and

moſt affectionate ſervant,

ANDR. SALL.

Dublin, May 20, 1680.

Honourable Sir,

LAST week I gave account to my good lady *Ranelagh* of my arrival here, and my going to *Navan*, and what diſpoſition I ſaw there towards the accompliſhing of her good ladyſhip's godly intention for the inſtruction of the children. Now I am to give yourſelf account of my endeavours to concur with your moſt noble and holy zeal of bringing the word of God to the hands, and hearing of this moſt miſerably blinded people. I conferred with my lord lieutenant, my lord biſhop *Meath*, and with the provoſt of the college upon the ſubject, and I found all three very willing to countenance and further the matter. I doubt not to find the ſame inclination in my lord primate and other worthy perſons. All do accordingly honour and commend your piety in reprinting the Iriſh teſtament, and do rejoice at the notice I gave them of the forwardneſs that work is in already by your means. I find both my lord biſhop of *Meath* and the provoſt willing to contrive the reading of it, and of Iriſh prayers in the college. I hope God will raiſe more of good ſpirits to advance this work for the good of poor ſouls. I pray be pleaſed to let me know, how forward that buſineſs is now in the print, and deſire Mr. *Rely* to give me a large and minute account of the matter, and what courſe he took to continue the work he was on, of altering ſome words improper and exotick of the copy, which I would wiſh may have the inſpection of ſome judicious and learned proteſtant, and without that to let the words go as they be in the copy. I pray ſend his letter incloſed to me in your own, and ſend it directed to Mr. *Fletcher*, or to Mr. *Foley*, fellow of *Trinity-college*, to be furthered after me to *Caſhell*, whither I do intend to ſet forth from hence within three days, God willing: there and elſewhere preaching in Iriſh, I will endeavour to prepare the way for the reading of your Iriſh teſtament. I pray let me know, whether you may think fit to truſt me with the help of other better judgments here to compile the preface to this edition, and what things you may think fit to add in it, to what I judge neceſſary to expreſs of the authors and advancers of that work both now and in the firſt edition.

I WOULD alſo deſire you to ſend to my lord biſhop of *Meath*, or to myſelf, a copy of the project for ſubſcriptions uſed at the printing of the Welſh bible, to be a pattern to us, both in this occaſion, and others, which I hope may happen of printing more of that kind. Now commending you and your noble endeavour to God's protection and guidance, I reſt,

Honoured Sir,

your ever affectionate ſervant,

AND. SALL.

Caſhell, Oct. 16, 1680.

Honoured and dear Sir,

I RECEIVED by this poſt yours dateleſs, but written in Auguſt (as I find by the contents

contents of it) to my great joy for knowing of your health and welfare, being not a little troubled in not having heard from you ſince my coming out of *England*, of which I have from you now the reaſon to my full ſatisfaction. I hear nothing yet from Mr. *Rely*, but am extreme glad for what you are pleaſed to tell me of the forwardneſs of that work about printing the teſtament, which I conſider not to be ſmall for the nature of the work. Since my laſt to you I ſpent my time preaching and catechiſing in Engliſh and Iriſh every Sunday in this city, and in the country near it, when God was pleaſed to viſit me with a dangerous ſickneſs of the country diſeaſe, ſo called here, by looſeneſs and vomit. I was given for dead. But God was pleaſed to reſtore me to my former meaſure of health. May it be for his honour and glory. I am nothing forgetful of your pious deſire, and my lady *Ranelagh*'s, touching a catechiſm to be made in Iriſh; and diſcourſing on the matter with my lord primate, his grace was very earneſt with me to make uſe of that in the common prayer book, as more fit for the capacity and memory of young and ſimple people. So I have done hitherto, finding it printed, and enlarging where I think neceſſary. I find beſides another larger catechiſm with places of ſcripture printed in Iriſh at *Dublin* the year 52. by one *Godfrey Daniel*, with rules for reading the Iriſh tongue, ſhort and excellent, taking up no more than half a ſheet of paper. I greatly wiſh they were affixed to the beginning or end of that book printing now. But only I offer this to your own wiſer conſideration, whether the reading of thoſe rules may not help many for the reading and underſtanding of the book. If this motion ſhould pleaſe, and Mr. *Rely* ſhould not meet with *Daniel*'s book there, I will upon your order ſend over a copy of the rules. I fully approve of your motion to apply in the preface what yourſelf and thoſe other worthies ſhall think fit of that uſed by the Janſeniſts in their French verſion, and am not a little joyed to hear ſo great an advance to right made in the Romiſh church, as to ſuffer the word of God to come unto vulgar tongues. My only intention for intervening in the preface was to ſecure, that the memory of the firſt and preſent patron of that work may not be concealed from grateful poſterity.

THE beſt and greateſt men of this kingdom do highly commend your pious zeal appearing in this work, and do approve of our endeavours to procure the ſpiritual welfare of this miſerably deluded people. But beſide the private oppoſition of the Romiſh clergy, who would have themſelves to be the only teachers, we have a more publick and bolder oppoſition by ſome of our own apparent but very falſe brethren, who are not aſhamed to profeſs a diſlike of our endeavours to convert the natives of this country, upon maxims like thoſe of the American planters, in hindering the converſion of their ſlaves to Chriſtian religion. One of them had the gallantry to tell me in my face, and at my own table, that while I went about to gain the Iriſh (to God I mean) I ſhould loſe the Engliſh. Our good archbiſhop has continual battles with them upon this ſubject. But I hope God will help us to carry on his work againſt oppoſitions, which ſhall never be wanting; and of this unwelcome tiding no more. My lord archbiſhop returns his very affectionate reſpects to you. He is a great honourer of your family, and how great an admirer his grace was of your honourable mother's virtues, you may ſee by an elegy he made on her death, being then fellow in the college of *Dublin*, of which I ſend here incloſed a copy to divertiſe you from the melancholy my narrative of the proceedings of others not ſo noble ſpirits might have ingendred. I perceive your family, among other bleſſings, has this of heroick women; not to ſpeak of the neareſt to you (fearing it ſhould come to her eyes or ears) I reckon your ſiſter *Burlington* among the beſt women, that ever I knew. God bleſs and proſper you all; and I pray excuſe the liberty my pen takes to prate, ſince my tongue is confined to more ſilence with you than I would wiſh. And now with my beſt reſpects preſented to my good lady *Ranelagh*, my lord *Burlington* and my lady, my lord *Clifford*, and the reſt of your honourable company, I reſt,

Honoured and dear Sir,

your moſt affectionate,

and moſt obedient ſervant,

ANDR. SALL.

Dublin, Nov. 8, 1681.

Honourable SIR,

THE letter here incloſed for you from my lord biſhop of *Meath* was ſent to me this morning to view, but now late at night was ſent again to me with order from his lordſhip to ſend it incloſed to you, ſome indiſpoſition having taken himſelf, which diſabled him to diſpatch it. He came much weakned from his journey to *Kilkenny* in bad weather; and though I ſaw his lordſhip better three days ago, I perceive he is turned ill again. I do heartily pray, and I think all may do ſo, that ſo good a man may live long. I have finiſhed the preface, which he ſpeaks of, and when a copy is drawn of it, I will ſend to you ſpeedily the original. I have ſeen the Janſenian preface, and made of it the very uſe you mentioned in your letter to my lord biſhop of *Meath*, both for my readineſs to obey you, and the reaſonableneſs of your command herein.

I AM daily and long time expecting the old teſtament in Iriſh to be ſent to me to ſee what it is, and what it wants, that I may contribute my ſmall endeavour, while thoſe few live, who have any zeal of the converſion of the natives here: how few they be I bemoaned ſadly and ſeriouſly with our lord

lieutenant this afternoon, admiring how few they were, that followed your heroick example, even of thoſe, whoſe calling did ſtrictly oblige them to it, and from whom I am to expect little thanks for my endeavours to co-operate herein. His grace would be glad to ſee my preface in Engliſh, to underſtand better the drift and profit of this undertaking; for which cauſe our learned friends do think it convenient, it ſhould be prefixed in both languages to this new edition; and I think no perſon fitter to tranſlate it than Mr. *Rely*, nor any printer fitter than the ſame formerly employed. I have received the book you ordered for me, for which I humbly thank you, and am much ſatisfied with the print. I pray let this ſatisfy Mr. *Rely*, until I ſee the old teſtament to give him more account of it.

I PRAY be pleaſed to preſent my moſt dutiful and hearty reſpects to my good lady *Ranelagh*, with moſt humble thanks to her ladyſhip, and to yourſelf, for your noble and conſtant goodneſs to me in recommending me to our great father here, who has now occaſion to befriend me in not hindring my lord lieutenant's deſire and the king's order to ſee me decently ſettled in theſe vacancies by the death of the biſhop of *Derry*. God's will be done. I am,

Honourable Sir,

your ever faithful ſervant,

ANDR. SALL.

Dublin, 19, Nov. 1681.

Honourable Sir,

HERE I ſend the preface promiſed in my laſt to you. My lord biſhop of *Meath*, the provoſt, and our other learned friends, who ſaw it, do think it appoſite and ſuitable to the genius of the people here, for inducing them to the reading of that book. What is contained in the looſe half ſheet, to be inſerted as noted in the beginning, I have added, in compliance with your direction, to let the people know the ſentiment and practice of learned men in the Roman church, about turning the holy ſcripture into vulgar languages. Our friends now mentioned do think convenient, that this preface ſhould be prefixed to the book both in Engliſh and in Iriſh, that ſuch as cannot read or underſtand the latter, may, by the former, perceive the profit of this undertaking. The duke, in his diſcourſe with me upon the matter, did ſeem to wiſh it were ſo done. If you think fit to order ſo much, I would deſire you to appoint ſome fit perſon to publiſh my Engliſh expreſſions where need is, and to get Mr. *Rely* to turn it to Iriſh, and ſend both printed hither, to join with the book, which is thought very neceſſary for the better ſucceſs and uſe of it. Speed herein is very much deſired by the well-wiſhers of our undertaking, which makes me ſend to you the original of my own hand, not being furniſhed with an amanuenſis to draw a legible copy.

MY lord biſhop of *Meath* continues ſick, which hinders me from ſeeing the old teſtament, which he promiſed to bring to me.

I BEG of you the favour to preſent my moſt humble and affectionate reſpects to my honourable lady *Ranelagh*, my lord *Burlington*, and the reſt of that renowned family.

BUT I am to beg earneſtly of you not to abridge any thing of the very dry and ſpare mention made in the preface of your holy zeal, in providing for the good of ſouls in this country, that it may be an encouragement to others to follow your example, and a confuſion to ſuch, as will not do it. The fear of offending your ſevere modeſty ſtopt my pen from writing much more, which my judgment and inclination would prompt to me; but once again I beg of you not to hinder any thing of the very little that is ſaid. This is all at preſent from,

Honourable Sir,

your moſt affectionate,

and moſt obedient ſervant,

ANDR. SALL.

I PRAY be pleaſed to remember my ſervice to Mr. *Rely*, and tell him, that when I can come by the old teſtament in Iriſh, I will endeavour to ſatisfy his enquiry about it. He ſhall oblige us all much in uſing care and ſpeed in tranſlating and printing the preface ſent herewith, that it may be bound up with the book to be diſperſed.

Dublin, Dec. 13, 1681.

Honourable Sir,

I HAVE the honour of yours, November 29, and am glad you received the preface, and that it pleaſed you, as I was to ſee ſome ingenious Romaniſts, who ſaw it, very much pleaſed with it. I know not, whether you will think fit to have the preface printed and prefixed to the book, both in Engliſh and Iriſh, that being thought by the well-wiſhers of this undertaking very convenient for recommending the book to ſuch, as yet underſtand not the Iriſh, or cannot read it, who are but too many even of the natives. It is much deſired, that the preface may come over with all the ſpeed poſſible, the binding of the books ſent in ſheets being ſuſpended till it arrives.

SOME ten days ago my lord biſhop of *Meath* ſent me the manuſcript of the old teſtament in Iriſh, a confuſed heap, pitifully defaced and broken. It was a work of very great labour, to bring it into ſome order. I ſent for a book-binder to bind up what I could gather, of which and another uncouth bulk, ſent to me from the college, I hope to make up a complete old teſtament, by the help of God, and of Mr. *Higgin* the Iriſh lecturer, if he

he be encouraged by our prelates, wherein I wiſh they may be more zealous than accuſtomed to be.

IT will be a work of great labour, and no little time, to draw up a clear copy of the whole, purged from errors and fooliſh additions or alterations, interlaced by ſome unlucky corrector, pretending to criticiſm in Iriſh. I pray be pleaſed to give notice hereof with my kind ſalutes to Mr. *Rely*, and my earneſt requeſt (if any weight may be thereby added to your command) that he haſten the work of printing the preface.

THE good biſhop of *Meath* continues ſtill very ill, keeping his chamber, though ſometimes up. I ſent now to know of his health, and am told, he was long time aſleep, which often comes upon him.

I BESEECH you, Sir, be pleaſed to preſent my moſt humble and affectionate reſpects to my good lady *Ranelagh*, my lord and my lady of *Burlington*, and the reſt of that moſt honourable family, ſpecially to my lord *Hyde*, who, by your honourable brother's means, was pleaſed generouſly to offer me his favour; and if his lordſhip, or my lord chancellor, my noble favourer, were induced to write a word in my commendation to my lord of *Ormonde*, it would avail much to make him remember the king's order in my behalf, and deal according to it with me. I am,

Honourable Sir,

your truly affectionate,

and moſt faithful ſervant,

ANDR. SALL.

Dublin, Feb. 7, 1681.

Honourable Sir,

AS ſoon as I received yours of January 21, I beſtirred myſelf, with all care poſſible, to effect your pious deſire of having the printing of the old teſtament in Iriſh to begin ſpeedily, and having found out haply a very able perſon to write Iriſh, I brought him to my houſe, and ſet him to work, and already has written out eight chapters of Geneſis, in a very fair letter, as legible as any print, and within four days will have the twelve ſheets, which Mr. *Rely* deſires to be ſent over, and as faſt as the print can go, I hope to ſend over ſheets in the ſame manner; to effect which, I ſent for Mr. *Reeves* this morning, who has promiſed me to find out friends, going hence to *London*, by whom we may ſend the ſheets, to ſave the great charges of ſending them by the poſt. I agreed with the ſcribe for one ſhilling for each ſheet; the provoſt and Mr. *Higgins* think that to be the leaſt he can expect, conſidering the ſpecial difficulty of writing that language. I deſire to know your own opinion, with Mr. *Rely*'s, upon that; as alſo that the ſubſcriptions may be immediately begun and ſent over, whereby to defray the charges of this writing. I wiſh my ſtock were as able as my heart would be willing to bear all myſelf. My labour and induſtry I will not ſpare, and will lay aſide other ſtudies I was engaged in to attend this work, being perſuaded, that none other can be of more importance for the glory of God and the good of ſouls in this poor country. I have been confirmed in this perſuaſion, by the great joy I ſee in the country, for the publiſhing of the teſtament, with many bleſſings on you, and prayers for you, whoſe great piety and bounty procured this happineſs for them. I am glad my good lady *Ranelagh* has that intereſt in the new biſhop of *Meath*, and is pleaſed to improve it for advancing this great ſervice of God. He is the only man: his predeceſſor a little before his death told me, he had gained to join with him in this work. But if my lady interpoſes, his aſſiſtance will be more aſſured. I hope I have gained ſomething upon his ſucceſſor, the dean of *Chriſt-Church*, now biſhop of *Kildare*, to join in the ſame holy deſign. I wiſh theſe two biſhops and the provoſt may be the propoſers and collectors of the ſubſcriptions, and that theſe may be immediately ſet going, both here and among your noble friends in *England*. Sir *Joſeph Williamſon*, meeting with me here laſt ſummer, did enjoin me to haſten the ſetting on the ſubſcriptions, to which himſelf and others there would willingly concur.

I WOULD think it very convenient, to prefix ſome few lines to the papers of ſubſcriptions, importing the benefit of this work to this nation: and none can better perform that than yourſelf, applying thereto ſome of thoſe conſiderations happily expreſſed in your excellent tract of the Stile of Scripture, which I have read with exceeding great pleaſure, praiſing God for thoſe gifts you received from him, and your good uſe made of them; both which I pray may be continued to you, with a long and happy life. What I can offer, is, the drudgery of inſpecting and correcting this confuſed chaos of papers, put into my hands, with ſuch auxiliaries, as God ſhall be pleaſed to provide for me. I write to Mr. *Rely*, the letter I make bold to incloſe here, not knowing how to direct it to him otherwiſe; in which I endeavour to encourage him for continuing the work of correcting the print, as I hope you will more effectually do by your authority; and truly I know none ſo able as he to do that work.

I PRAY be pleaſed to let me know by the next, how you will have the three hundred and fifty teſtaments, now to be bound with the preface, to be diſpoſed; and how many you will be pleaſed I may beſtow on ſuch as ſhall make the beſt uſe of them, for the end pretended to; and whether you think fit, that ſome of them may be expoſed to ſale, at a low rate, that may encourage the people to buy them. Several gentlemen of the country, Romaniſts, came to me this term, earneſtly deſiring to have them for reading to their families; and one promiſed to urge their prieſts to read chapters of it at maſs to the congre-

gation. For this purpoſe I wiſh, that a great number of the next edition may be expoſed to ſale at a low rate. I crave the favour of preſenting my cordial reſpects to my honourable lady *Ranelagh*, and the reſt of your renowned family; and, praying for all happineſs to you, I remain,

Honourable Sir,

your moſt affectionately devoted

and much obliged ſervant,

ANDR. SALL.

I HAVE little to ſay of my concerns; all the vacancies filled, and no effect appearing of great promiſes given to me. But as reward of that kind did not invite me to begin, I hope the want of it, by God's help, will not hinder me to proſecute.

MY dwelling is next houſe to *Youngs-Caſtle* in *Oxmans* town.

Letters from the lord Maſſereene *to Mr.* Robert Boyle.

Antrim, Dec. 15, 1680.

SIR,

HAVING laſt night been called out of our houſe to view a blaze or faint pale ſtream, which roſe above our horizon, and put us all to great wonder; I took out the celeſtial globe, and my ſon a quadrant, and had ſeveral perſons with us to obſerve the thing and the motion; the deſcription whereof (as well as we could make it) is here offered you, and deſire to know, if it appeared at *London*, or if you have obſerved or heard any thing of it.

I SHALL every night take notice, and in the mornings alſo, if it appear again, as we conclude it will; and ſubmit this incloſed narrative to your ſerious and judicious ſcrutiny. I have ſent the like to Sir *Samuel Morland* by this poſt.

PARDON this haſty and rude addreſs. I am,

Honoured dear Sir,

your very affectionate,

and humble ſervant,

MASSEREENE.

Incloſed in the preceding.

In the north of Ireland, *at* Antrim, *Dec.* 14, 1680.

ABOUT half an hour after four o'clock this afternoon, the evening being clear, and the moon bright, was obſerved at this place (which is in the lat. 54 deg. 30 min.) a ſtrange phænomenon. About ſouth-weſt a ſtar of the fourth magnitude (as we reckoned by its appearance a little above the horizon) emitted a ſtrange luminous body, or ray, which aſcended after the manner of a pillar about 45 degrees towards the Zenith, in a direct line, about ſix o'clock when it was at the longeſt. At the bottom it appeared about a foot broad, compact and fiery, increaſing gradually in breadth, till about the middle, it appeared more than two foot broad, more clear and pale: from thence in its aſcent (by the heel of Antinous through Aquila, to the neck of Cygnus to our obſervation) it grew more rare and ſlender toward the top. Its bright tail or fiery emication followed the motion of the ſtar, and others, which accompanied it, ſtill retaining the ſame poſition, till it came to due weſt, where the ſtar ſet, and its tail grew ſhorter and ſhorter, till at length about eight o'clock it quite diſappeared.

Fiſherwick near *Lichfield*, Oct. 8, 1690.

Much honoured Sir,

WHAT was ſo remarkable in this and divers places adjacent, between the hours of ſeven and eight in the morning yeſterday, I offer to your conſideration, which was undoubtedly true as I relate it, and may poſſibly confirm the ſame account from other places, concerning an earthquake, which happened at that time here, and at *Lichfield*, three miles off, as one of the bailiffs to me this day affirms; and it was at *Aldraws*, a town two miles off, belonging to baron *Turton*, as I was aſſured, and by my wife, my ſon, and daughters, and divers of the ſervants in this houſe obſerved, and by the children in ſeveral rooms taken notice of at the ſame preciſe moment of time yeſterday morning, by the frightful concuſſion of the Rooms, partitions of the houſe, pictures, beds, and other moveables, one door flying open as my ſon Sir *George* ſat near it, and he thought the beams of the houſe had given way. There was no great wind at the time, but the day before thunder and lightning, and ſome ſort of tempeſtuous winds, but at that time none at all. I was in bed aſleep, and did not obſerve it; but all others in bed at that hour, and thoſe who were riſing, agree in one ſort of narrative thereof; and is not unworthy your knowledge, who may from other hands have the ſame intimation. My ſervice to my dear aunt *Ranelagh* and couſins. I am rejoiced to hear, that *Cork* is ſurrendred. I am,

Sir, your moſt affectionate,
humble, and faithful ſervant,

MASSEREENE.

A Letter from Dr. Narciſſus Marſh *to the Biſhop of* Meath, *occaſioned by one from Mr.* Boyle *to that Prelate.*

Aug. 27, 1681.

My lord,

HAVING carefully read over the Janſeniſts preface to the new teſtament, publiſhed by them in French, I make bold

to give your lordſhip my preſent thoughts concerning it; but with that deference and reſpect, which I owe, and always will bear, to your lordſhip's and other better judgments.

THE preface I find to be very well penned, and adapted to the book, whereto it is prefixed, ſerving the deſign of the publiſhers of that tranſlation as properly as can be imagined. But being ſo proper to that tranſlation, I fear it may not ſo well ſerve another, eſpecially one publiſhed by proteſtants, for theſe following reaſons.

1. BECAUSE there are ſome reflections in it a little too ſevere on proteſtant tranſlators, which cannot well be countenanced by us.

2. THERE is a ſentence or two, which I obſerved in the original, to ſavour too much of popery to paſs a proteſtant preſs.

3. PART of the preface is ſpent in ſhewing the imperfections of the old French tranſlation of the new teſtament, and why a new French tranſlation thereof is requiſite; which would be beſides the purpoſe, ſhould this preface be printed with any other tranſlation.

4. MANY paragraphs are written to ſhew, what rules were obſerved in this French tranſlation; ſome whereof cannot, and I believe others do not agree to any other tranſlation; and therefore that alſo would be beſides the purpoſe.

5. THE authors of that preface have beſtowed not a little pains to ſhew, how difficult (if not impoſſible) a thing it is to make an exact tranſlation of the bible; which though true, yet whether it be adviſable, that it ſhould be made known to the commonalty of this kingdom (who are already but too much addicted to the vulgar, which they eſteem as authentick) is worth while to conſider.

Now if all theſe things be let continue in the preface, I fear it will not anſwer the deſign; beſides other inconveniencies, that may follow it: and if they be left out, the preface itſelf will then be both maimed and inconſiderable.

THUS I have freely given my opinion in this caſe; but with due reſpect and ſubmiſſion to your lordſhip's judgment, and with an appeal alſo to your lordſhip's candour and favour for what I have done, whereof it ſtands very much in need; and which, together with your bleſſing, I crave on,

My lord,
your lordſhip's moſt dutiful,
and obedient ſervant,
NARCISSUS MARSH.

I HAVE herewith ſent the tranſlation of the preface, but mended in the firſt page, that your lordſhip may diſcern how imperfectly it is done, and much beſide the original.

Letters from Dr. Narciſſus Marſh *to Mr.* Boyle.

Trinity-College near *Dublin*, Dec. 27, 1681.

Honoured Sir,

THE ſeeming neglect, whereof I have been guilty, in not paying you my humble and hearty thanks for the favour that you did this college and me in ſending the Iriſh teſtaments hither, is crime enough to make me aſhamed now to attempt it. But ſince the delay of this my duty was ſolely cauſed by the biſhop of *Meath*'s indiſpoſition, which rendered (and ſtill does render) him unable to look after the diſpoſal of theſe books, whereof I was deſirous to give you an account; and ſeeing that he is not likely for ſome time yet to be in a condition to do it, I could no longer (without great indecency) forbear the return of my humble acknowledgments in my own behalf for the book, which you were pleaſed to preſent unto me, and in this college's name alſo, for that ſent unto our library, and for the other forty deſigned for the uſe of the college, in inſtructing the young ſtudents of it in the Iriſh tongue. All which are accordingly employed, with good ſucceſs, to the uſe, for which they were intended.

AND here I cannot but take notice, that the whole deſign of teaching Iriſh muſt of neceſſity have fallen to the ground in a very little time, had not you ſeaſonably aſſiſted and encouraged the undertaking by your books, as well as otherwiſe; which has now put life into it again, and ſo ſet it on foot, as that I have hopes it will at length come to maturity; ſince both the young men are willing to learn, and Mr. *Higgins* alſo is induſtrious to teach them, and by his Iriſh ſermons invites many to come to our church, who are of another perſuaſion, his auditors being ſeldom fewer than three hundred, whereof ſeveral papiſts.

In order to the better carrying on of this deſign (which I hope that God will crown with ſucceſs for the good of this nation) I have been at ſome pains in collecting (out of ſuch helps as I could get) and digeſting a very compendious Iriſh grammar, fitted for the uſe of learners, which is almoſt finiſhed, and ſhould be printed, if I knew how to get it done. I believe a brief dialogue in Iriſh and Latin would do well to be annexed to it, ſince it will not ſwell it to any conſiderable bulk, nor ſo much enhance its price, as render it uſeful.

THE reſt of your books (beſides thoſe ordered for particular perſons, and which were given to them accordingly, as I preſume my lord biſhop of *Meath* has informed you) are in my cuſtody undiſpoſed of, though deſired by ſeveral gentlemen abroad, who are lovers or promoters of the Iriſh tongue. But I can do nothing herein, until I may receive my lord biſhop's directions, with whom they were entruſted; unleſs at any time you ſhall pleaſe to ſend yours, which ſhall be punctually obſerved by,

Honoured Sir,
your moſt obliged,
humble ſervant,
NARCISSUS MARSH.

Honoured

Dublin, April 8, 1682.

Honoured Sir,

I HAVE newly received the prefaces to the Iriſh teſtaments, which, as ſoon as bound, ſhall be diſtributed ſo as may beſt anſwer the end of your printing them; but herein I would gladly receive your directions, before I do any thing, if you have any to give in particular. The deſign of printing the old teſtament in the ſame language has received a great (though I hope not a fatal) ſtroke by the death of Dr. *Sall*, who departed this life April 5. in the evening, having been for ſome time a little indiſpoſed (but not at all very ill) of a cold; ſo that his death was almoſt ſudden and unexpected. I intend, that the reviſing of that old tranſlation of the old teſtament, and its tranſcription, ſhall nevertheleſs go on with the help of Mr. *Higgins* and ſome other Iriſhmen, whom I will call in to aſſiſt; if I can but diſcern, that by God's help, I may be able to guide and direct the management of the work, what pains ſoever it may coſt me. And for ſubſcriptions, I doubt not but enough might eaſily be gotten to ſo pious an undertaking, were it put into a due method, for which I ſhould be glad to receive your inſtructions. And in order to the ſetting this on foot ſucceſsfully, I believe it would be convenient, that we ſhould have one ſheet printed off, to exhibit as a ſpecimen of the whole work, and of the real deſign there is to go thorough with it.

I HUMBLY thank you for the encouragement, that you gave in your letter to Dr. *Sall* for the printing my little grammar, which ſhall be put into Engliſh (whereby it will become of more general uſe) as ſoon as I can get a little leiſure to do it, and then I will give you a more perfect account thereof, and of ſuch other things, as may relate to your truly pious and good work, and the end thereof, which is to acquaint the poor ignorant ſouls of this kingdom (who ſit in moſt lamentable darkneſs) with the word of God, whereof they now know nothing. Certainly God will reward what has been done that way already, and will not ſuffer that, which remains yet undone, to come to nought for want of encouragers. In confidence whereof, I reſolve to proſecute this undertaking with all the vigour that may be, and to truſt God with a bleſſing thereupon, who never fails thoſe, that depend on him, eſpecially in buſineſs, that directly tends to the manifeſtation of his will, and thereby the ſalvation of ſouls. I am,

Honoured Sir,
your very humble,
and obliged ſervant,
NARCISSUS MARSH.

Dublin, June 23, 1682.

Honoured Sir,

I LAY hold of the opportunity, which this gentleman affords me, to let you know, that ſince Dr. *Sall*'s death, I have taken upon me the care to ſee the Iriſh bible tranſcribed and fitted for the preſs. The work goes on ſucceſsfully, there being above a hundred and forty ſheets tranſcribed already. All our care at preſent is, how to get the charges of tranſcribing and printing it to be defrayed, which muſt be done by ſubſcriptions; to facilitate which the biſhop of *Meath* and I have upon conſultation thought of this way (if you ſhall approve of it) *viz.* to make this propoſal, that whoſoever will ſubſcribe ſo much money, as upon computation we ſhall find the old teſtament printed will be worth (we gueſs it may be a guinea, or thereabouts) he ſhall have the new teſtament in hand, and the old teſtament, when it comes out. If you think this way may prove prejudicial to your charitable deſign, becauſe haply many men would be glad to have the new teſtament, who cannot ſpare a guinea to purchaſe the old, then the biſhop of *Meath* deſired me to mention another expedient for it, which is, after a hundred and fifty of the copies are freely given to ſuch as are indigent, to expoſe the reſt to ſale, whereby money may be raiſed for the carrying on the other work. I deſire to know, whether you do approve of either of theſe ways, and therewith alſo what the charges of printing the old teſtament may come to. The copies of the new are now almoſt bound, and ready to be diſperſed.

Mr. *Reeves* informed me, that you had ordered five pounds to be paid to Mr. *Higgins*, but before he would do it, made inquiry of me concerning his condition. I gave him the ſame anſwer, that I write unto you, which is, that he does not deſerve it, both becauſe he has gotten good preferment worth at preſent 110 l. per ann. and alſo becauſe he has put himſelf out of a capacity of being farther ſerviceable towards the carrying on my deſign of teaching Iriſh in the college, by getting him a wife as ſoon as he had gotten himſelf preferment; ſo that he is very ſhortly leaving me, and I muſt be at new charges to provide another to ſupply his place; notwithſtanding that his preferment was given him on purpoſe, that he might promote this deſign, and to fix him to the college. If therefore, Sir, you pleaſe, that this five pounds ſhould be paid to the Iriſhman, who tranſcribes the old teſtament, and that it ſhall go in part of payment for that he hath done, I will take care, that it ſhall be truly paid him, and I am ſure it will be better beſtowed by much, than it would be on Mr. *Higgins*, who in other things beſides theſe mentioned has not ſhewed himſelf to be ſo virtuous a man, as I could wiſh him to be.

I HAVE not been able yet to get leiſure to tranſlate the Iriſh grammar, whereof I formerly made mention, and to fit it for the preſs; but ſhortly hope to find leiſure enough for a work of no greater pains than that will be.

SIR, the bearer hereof is one Mr. *Mullan*, bachelor of phyſick of this college, who has been ſucceſsful in ſeveral things, that he has undertaken,

undertaken, eſpecially in anatomy, wherein he has good ſkill; and had an opportunity the laſt ſummer to exerciſe it on an occaſion, that rarely occurs, namely, in diſſecting the elephant, which was burnt here in *Dublin*; whereof he will give you as perfect an account, as can be expected from one in thoſe circumſtances, that he then was, if you deſire it, he having committed all to writing. He will alſo give you ſome account of a caſtor, that he here diſſected.

BUT I have too long troubled you already, and ſhall therefore beg leave here to ſubſcribe myſelf,

Honoured Sir,

your very humble ſervant,

NARCISSUS MARSH.

Mr. Boyle *to Dr.* Marſh.

London, Auguſt 1, 1682.

Worthy SIR,

I AM troubled, and almoſt aſhamed, that I muſt begin this letter with the acknowledgment of a diſaſter, that befel yours before it came to my hands: for it being brought yeſterday from the poſt, not directly to me, but to a ſervant, that was then buſied about the fire, to make a chemical experiment, I had ordered him to attend in my abſence, he having laid it by for a while, a kindled coal unluckily lighted on the letter, and burned it quite thorough in that part, that contained (as I conjectured) ſome of the moſt important paſſages of it. However, being very deſirous to prevent delays, I ſhall venture to anſwer what I gueſs to have been the main contents of it. It ſeems then to me the deſire, both of my lord biſhop of *Meath* and yourſelf, that for expedition's ſake I ſhould advance the money I have here ſet apart for that work, to give it a beginning; and his lordſhip promiſes, that he will procure bills for 50 l. more in few weeks, which added to that money of mine, his lordſhip (reaſonably preſumes) will be a ſufficient encouragement to the printer to begin forthwith, and to engage Mr. *Rely*. I can without reluctancy conſent to this propoſal, it being in effect little, if any thing more, than what I formerly offered myſelf. And in compliance with it, I have already ſent to Mr. *Rely* (to whom I ſhewed your letter) and got him to go to ſeek out the printer, and engage him: of which if he brings me a ſeaſonable account, you may receive it with this paper; but I am loth to loſe this night's poſt upon the uncertain expectation of it. I had yeſterday in the evening the honour to be viſited by the biſhop of St. *Aſaph* and the biſhop of *Kildare*, who both of them together ſeemed much to approve what we are doing. Of the former, becauſe his dioceſe is in *Wales*, I earneſtly deſired a copy of the forms of the ſubſcriptions for the printing of the Welſh bible, which he readily promiſed to do his endeavour to procure. But, though I am confident of his ſincerity, yet (he being this day to leave the town) I much doubt of his ſucceſs, and therefore will not loſe time in waiting for the event. My lord biſhop of *Kildare* did not only ſpeak affectionately of our deſign, but was pleaſed to deſire me to let him know when he is in *Ireland*, wherein he may promote it, which he appears very forward to do. This offer was too advantageous to be refuſed, and accordingly I embraced it with thanks; and hope good uſe of it will be made, as occaſion ſhall require, by my lord of *Meath* and yourſelf; who have both of you been the early and eminent promoters of this work; and therefore will be glad to receive ſo conſiderable an aſſiſtant in carrying it on. The abovementioned diſaſter keeps me from being able to read ſomething towards the cloſe of your letter, that ſeems to relate to ſubſcriptions, and that in a way more honourable for me than is needful. But as to the propoſal, that I would conſent, that the 50 l. I long ſince lodged in Sir *John Champanty*'s hands, ſhould be received at *Dublin*, and employed to defray the charge of tranſcription, *&c.* (by which *&c.* I ſuppoſe you mean ſome other charges, for the ſum, I hope, will bear it) ſince I look upon the having copies duly prepared for the preſs, as a neceſſary part of the work, I am willing the money mentioned ſhould be employed as is deſired, and ſhall (God permitting) ſpeedily take order to have it aſſigned for thoſe uſes.

SINCE I told you I had ſent Mr. *Rely* to the printer, he is come back to me, and brings me word, that he could not poſſibly find him, but preſumes he ſhall do it to morrow; and deſires the aſſiſtance of a ſervant of mine, who is not unacquainted with the law, to help him to draw up the agreement; whereof I hope you may in my next receive a particular account from,

Worthy Sir,

your moſt affectionate,

and moſt humble ſervant.

Dublin, September 30, 1682.

Honoured Sir,

BOTH your laſt of September I have received, and am much of your opinion, that for the reaſons mentioned the marginal renderings ought not at this time to be inſerted, could it conveniently have been done, and had you fit letters for it; chiefly becauſe it would give too great an advantage to the adverſaries againſt this tranſlation, by furniſhing them with an argument, from its ſeeming dubiouſneſs and uncertainty. But the parallel places being of good uſe, and not bringing along with them the ſame inconveniencies, I ſhall take care, that henceforth they be inſerted in all the copy, that ſhall hereafter be ſent; that ſo Mr. *Rely* may not have more laid on him, than needs muſt.

I AM

I AM very ſorry, that Mr. *Rely* has reaſon to make ſuch complaints of the tranſcriber's negligence; whereof I knew nothing before, but have now given him a ſpecial charge about it; and do moreover wonder, how ſo many faults could eſcape the diligence of Dr. *Sall* and Mr. *Higgins*, in examining the copy; moſt of what has been yet ſent being done by them. I have now taken another courſe, which I hope will prevent the like for the future. And indeed this, and the gentleman's falling ſick, whom I chiefly make uſe of for the comparing, examining and adjuſting the copy, has made me the ſlower in ſending over more, than otherwiſe I ſhould have been. Next week I hope to ſend all to the end of the Pentateuch; and after that I dare promiſe, that they ſhall want no more, if I might but know the means how conſtantly to ſend it, as I have it ready; whereof I ſhould be glad to be informed, if you know of any.

MY lord biſhop of *Meath* (as likewiſe the biſhop of *Kildare*) gives you his humble ſervice, and deſires me to inform you, that, in order to the getting ſubſcriptions, he has written unto ſeveral biſhops, whoſe anſwers (which he ſhewed me) generally are, that they will caſt in their mites for the carrying on ſo good a work, when they know what methods will be uſed for the gathering them, and alſo what others give, that they may have ſome pattern to conform unto.

LATELY underſtanding, that my lord archbiſhop of *Canterbury* was very ſolicitous to know, what is become of biſhop *Bedell*'s tranſlation of the old teſtament into Iriſh (becauſe he is now about to write his life) and it being the copy, that I have, I gave his grace an account where it is, and what is doing with it, and likewiſe, that through your care, as well as at your preſent charges, it is begun to be printed. If I may judge by what I have heard concerning his grace's zeal for the work, I cannot doubt, but he would be ready to encourage it, if application were made to him.

I HAVE only this to add, that I have received your fifty pounds from Sir *John Champanty*, whereof you ſhall have a punctual account how I diſburſe it; that one hundred of your Iriſh teſtaments are to be ſent next week to *Caſhell*, to be diſpoſed of by my lord archbiſhop in that province, now that his grace is well enough to do it; and that I am,

Honoured Sir,

your very humble

and obedient ſervant,

NARCISSUS MARSH.

I HAVE been ſo unhappy, as not to be able to make any obſervations on the late comet, nor to ſee it more than twice, when its head appeared to the naked eye much bigger, and its tail much ſhorter than that of the laſt. The virtuoſi in *London*, who are always intent on what is rare, I preſume have not let it eſcape their accurate obſervations.

I HAVE ready tranſcribed as far as Ezra; but intend to have it all examined with a great deal of care, before it be ſent, becauſe ſo many faults have eſcaped in what is gone already.

Dublin, February 17, 1682-3.

Honoured Sir,

I HAVE been but too long ſilent, which I cannot charge upon want of health, I praiſe God, but chiefly upon extraordinary and troubleſom occaſions. Nevertheleſs the tranſcriber goes on with his work, having written as far as the end of *Jeremiah*'s propheey. I have alſo gotten examined, and ready to be ſent, as much copy, as reaches to the middle of the firſt book of Kings; only I want an opportunity of conveying it to *London*, which I have a long time waited for in vain, but will ſhortly, if poſſible, find one out. I have hitherto found it very troubleſom to get the copy well examined, becauſe it is hard to get thoſe together, who ſhould do it, their other occaſions calling them another way; which is the only reaſon, why the printer has not been better ſupplied. I have urged the biſhop of *Meath* to haſten the ſubſcriptions (who has taken upon himſelf that part of the work, namely, to get ſubſcriptions) but I do not find, that any are yet received by him.

WHAT Mr. *Rely* objects againſt the Iriſh tranſlation, that it follows the Engliſh too much word for word, whereby the phraſe many times is rendered leſs proper and more obſcure, is confeſſed by thoſe, who well underſtand the language, to have much of truth in it, as to the firſt part of the allegation; but they add, that though the Iriſh thereby may be leſs elegant, yet it is proper enough, and never the leſs intelligible by the vulgar people; yea they think it is a good, plain, familiar tranſlation, and that if it were more elegant, it would not be ſo fit, as now it is, for common uſe. This I ſpeak, not as vindicating the tranſlation myſelf, but as dictated to me by ſome others. The gentleman, who corrected the laſt ſheets and inſerted his alterations, I fear, will not get leiſure to do much more after the ſame manner; and for the ſcribe, I put him upon uſing all the care that he can, and the greateſt ſkill that he hath, who is the beſt at that work, that can be gotten here. The tranſlation, I conceive, ought not lightly to be altered, but where it is faulty, out of reſpect to the author of it, biſhop *Bedell*, whoſe memory I know that my lord archbiſhop of *Canterbury* does honour; and with what care he cauſed it to be made by Ulſter-men, is ſufficiently known. The grammar I formerly mentioned, as it is not yet finiſhed, becauſe other buſineſs has conſtantly hindered me from taking it in hand again, ſo neither is it quite laid by, but ſhall ſhortly, God willing, be reſumed and finiſhed, if one difficulty about the verbs, wherein I ſtick can be ſurmounted, whereof I do not deſpair.

deſpair. But the misfortune is, that I cannot meet with an Iriſhman, who underſtands any thing of the grammar of his own language; ſo that none (or but very little) help is to be had from them, in order to the finiſhing this work, which I hope will nevertheleſs be ſhortly completed by,

Honoured Sir,

your very humble ſervant,

NARCISSUS MARSH.

AN unfortunate fall from my horſe, whereby one of my arms was ſo bruiſed, that I could not, for a long time write, has partly occaſioned both my ſilence and neglect of finiſhing the grammar.

Stapleſtown, near *Catherlaugh*, Aug. 24, 1685.

Honoured Sir,

IT has not been without reaſon, that I have been thus long ſilent. For being removed into the country, I left the remaining part of the Iriſh bible, namely, the apocrypha, in the ſame hands, that reviſed a great part of the reſt, to examine whether it be truly written, or no; it being then all (or very near all) tranſcribed. But not being upon the place to call on him to diſpatch the work, I fear, that he has done little or nothing to it; which yet would not be much material, if the copy could be gotten out of his hands. For he, thinking, that he has an advantage, refuſes to deliver it (as Dr. *Huntington* informs me, he being a maſter of arts of the college) unleſs I will pay him twenty pounds for his labour of reading it over, which I think is very unreaſonable, and that he has had enough already, when I gave him four pounds ten ſhillings for that very work of reading over the tranſcript. The man indeed is very poor, and I believe that is the thing, that makes him ſo unreaſonable in his demands.

BUT it falls out very luckily, that you do not intend to print the apocrypha at this time, as I am informed.

SIR, if this buſineſs had been well over, I ſhould, before now, have given you an account of the diſburſement of your fifty pounds, that I received in *Dublin*, to pay the tranſcriber, &c. with whom Dr. *Sall*, in his life time, agreed for tranſcribing the whole Iriſh bible, at twelve pence per ſheet; which was not very dear, conſidering how difficult a thing it was to read the copy; it being in many places not legible, and in others ſeveral words together quite effaced, either through age, or ill uſage, or both; the book alſo having taken wet, whereupon he was forced to tranſlate paſſages here and there anew. The ſcribe moreover had the advantage of his diet at Dr. *Sall*'s, and of writing in his houſe; neither of which I could grant him in the college; and therefore he was earneſt to have an allowance made for that, beyond his twelve pence per ſheet; which not being part of his bargain, I did not think it reaſonable to yield thereunto; though ſome advantage he did make in another reſpect, by writing in ſmaller paper than he at firſt began upon, becauſe no larger was then to be gotten in the town.

SIR, I have not quite laid aſide the thoughts of an Iriſh grammar; for though ſome difficulties ſeem to me almoſt inſuperable, notwithſtanding the helps both of books and men, that I here meet with for that purpoſe, yet diligence, I hope, will conquer moſt of them, and the reſt muſt be left to be reſolved by ſuch as are well ſkilled in the language. However I have gotten together ſuch a collection of rules and examples, as will be no ſmall help to the learner, both as to the reading and writing of that language, and alſo the true underſtanding of it; moſt of which are already digeſted, and want only to be tranſlated into the Engliſh tongue, as you formerly deſired to have done. Between four and five ſheets, I ſuppoſe, will contain the whole, which ſhall be diſpatched as ſoon as I can; but I can promiſe nothing certain for the time, being daily diverted by other buſineſs. My endeavours ſhall not be wanting, to give it a ſpeedy diſpatch.

THE diſburſement of your money is as follows.

	l.	*s.*	*d.*
	50	00	0
PAID for tranſcribing 719½ ſheets	35	19	6
For pens, ink, and paper (whereof 18 quires were 8 *d.* per quire, the reſt 6 *d.*	00	18	0
For tranſlating 17 pſalms, that were wanting	03	00	0
To Mr. *Mullan*, for reviſing the tranſcript.	04	10	0
At the Cuſtom-houſe, for the Iriſh teſtament	00	09	2
	44	16	8
So that there remains in my hands due to you	05	03	4

Which ſum ſhall be paid as you ſhall order it.

SIR, the charges of tranſcribing, you perceive by the above account, are unreaſonably great, being much more than you computed they would amount to. But if you ſubduct the following ſums, which, I ſuppoſe, was not thought of in your computation, *viz.*

FOR tranſcribing about 157 ſheets of the apocrypha (for I compute it in the tranſcript to be above a fifth part of the whole bible)	35	19	6
	07	17	0
The remaining ſum of ——	28	02	6

will be the charge for tranſcribing the bible; beſides what was paid for paper, reviſing, and tranſlating, as above.

I WILL endeavour to get the apocrypha out of the reviſer's hands, that all that charge may

may not be thrown away. What of your new teſtaments are yet undiſpoſed (and ſome there are, though not many) I think may go along with the old teſtament, to ſuch as have none of it already; wherein, as alſo in any thing elſe, within my power, I ſhall be moſt ready to ſerve you to the outmoſt of it; being very deſirous to approve myſelf,

Honoured Sir,

your very humble

and obedient ſervant,

Narciſſus Fern. & Leighlin.

Stapleſtown, March 22, 1685-6.

Right honourable,

I OWN to have received a letter from you ſometime ſince by the hands of Sir *Paul Ricaut*, wherein you impowered me to beſtow ſomething of your money (yet remaining in my hands) on Mr. *Mullan*, who reviſed the tranſcript of the Iriſh bible, in order to the redeeming from him the tranſcript of the apocryphal books, which he detained. Accordingly, by the advice of Dr. *Huntington*, our worthy provoſt, I gave him ten plate cobs, in your name, and redeemed the copy, which I lodged with Dr. *Huntington*, to be ſent to you, when there ſhall be an opportunity, as you ſhall require. I attribute this manner of acting to have proceeded from Mr. *Mullan*'s miſerable poverty; who, though a divine, a convert, and reaſonably well learned, has not yet been ſo fortunate, as to get any preferment, nor I been able to beſtow any upon him, as I have long deſigned.

UPON the hint in your letter of my lord lieutenant's favourable thoughts of this deſign of publiſhing the bible in the Iriſh tongue, I made bold to addreſs to his excellency about it (and that the rather, becauſe I have gotten a great deal of ill will from ſome great men in this kingdom for what I have done in promoting this good and charitable work, which has been no ſmall diſcouragement to me.) His excellence was pleaſed to promiſe his encouragement and aſſiſtance towards the carrying it on, both by his purſe and otherwiſe; but withal was ſurpriſed to hear what I related of the diſcouragements (and indeed threats) that I have had on this account. The unwelcomeneſs of this undertaking to many in this country, I believe, was the reaſon, why the biſhop of *Meath* flew off from proſecuting what he deſigned and promiſed, and has ever ſince been wholly unconcerned, and ſat neuter. Notwithſtanding all which, I hope to finiſh the deſigned grammar, wherein I find many unexpected difficulties, and no body able to ſolve them. An account of the Iriſh language, as to the original and nature of it, long ſince promiſed to the provoſt, is now coming to me: if any thing in it be material, care ſhall be taken, that it be fitted to be joined with the other. The great charges and care, that you have been at in printing the old teſtament, will, I hope, find that acknowledgment, and the pious work find that acceptance amongſt the generality of this kingdom, as they really do deſerve; and that a means will yet be found out to commit the book of common prayers in the Iriſh tongue to the preſs alſo; that ſo the deſign of the canons of this church, which require every pariſh to have the bible and book of common prayers in Iriſh, may be anſwered. I ſhall at preſent add no more, but that I am,

Honoured Sir,

your very humble ſervant,

Narciſſus Fern. & Leighlin.

	l.	*s.*	*d.*
Remained on my former account	5	03	04
Paid to Mr. *Mullan* 10 weight cobs	2	07	06
Remains in my hands	2	15	10

YOUR letter directed to me at *Stapleſtown* near *Carlow*, would have come ſafe to me by poſt.

Letters from Dr. William Avery *to Mr.* Robert Boyle.

Boſton, New-England, Nov. 9, 1682.

Honourable Sir,

IT is almoſt an unpardonable boldneſs in ſo mean a perſon as myſelf, to give your honour that trouble, which more than once you have received from me; and the reſpect and condeſcendency which you have already ſhewn me, is that, for which I can never make any ſuitable return.

HONOURABLE Sir, my earneſt deſire to be a comfort to the ſick makes me reſtleſs in my deſires and endeavours to do better for them than yet I can. But ſince the death of that my reverend friend, of whom I have made former mention to yourſelf, I can have but little correſpondence with any ſtudent in phyſic among ourſelves, as to what concerns chemical operations. I have earneſtly endeavoured to find the alcaheſt, and have for that end had an eye upon ☿, upon ☐, upon ♀— and upon the ſcum, that is found in many places ſwimming on the top of the waters (that I might make my experiments conformed to the ſeveral hints that I have met with in my authors;) but as yet I have been unſucceſsful: and if your honour could ſee cauſe to aſſiſt me in this difficult work, I cannot but hope, that the great God would fully recompence ſuch charity, ſhewn not only to me, but unto the ſick—unto many ſick ones. *Matt.* xxv. 43.

BUT I forbear—

I HAVE,

I HAVE, with my worthy friend, Mr. *Richard Wharton*, ſent your honour a few minerals, with a note of them incloſed in this paper. I have alſo ſent unto your honour, two or three little books, that are a narrative of the afflictions, which a Chriſtian gentlewoman underwent in and by our Indian wars. There were indeed many, whoſe ſufferings were like to hers, but where are the nine? I ſhall juſt give your honour the diverſion of one paſſage here.—There was one, who in a ſkirmiſh with the Indians was ſhot with a bullet in at his right ear, and when the ſurgeon came to dreſs it, that which he injected at the right ear came out at the left eye—and yet the man recovered—is now living—was lately at my houſe—

AND now let your honour give me leave to be emptying of my little rivulets into an ocean, and ſet two or three more of my poor obſervations in your view.

HONOURABLE Sir, it has ſurpriſed me to ſee, how wonderfully the earth brings forth, according to the firſt command, even where there can be no ſuſpicion of any ſeed to be conveyed unto the place, and where the earth perhaps in reaſon would be the moſt unapt for fruitfulneſs, as being digged out of cellars, and out of the bottom of deep wells. There have I ſeen herbs ſpring as thick as they could ſtand well one by another; and taking up divers of them, I have found the huſk of a perfect ſeed, which has divided itſelf in its coming forth of the ground, like the ſeeds of herbs of that kind, that afterwards ſpring from them: but thoſe ſeeds, which the unaſſiſted earth produced of itſelf, were far leſs than others—perhaps by a fourth part—

SIR, Mr. *Wharton* and my ſelf being at the ſhop of a braſier in *Boſton*, we ſaw clay there, that had been brought from an iſland adjacent, called, *Martin*'s Vineyard—Of this clay they uſed to make melting pots. The clay was brought by ſea, in a barrel. They unheaded the barrel, took clay for their preſent uſe, and headed it up again. But the next time they came to open the barrel for more clay, they found a great part of it turned to a black duſt, and the clay next the duſt was become uſeleſs. This Mr. *Wharton* and myſelf were eye-witneſſes of, and ſaw, that there was no ſuſpicion of any deceit in the matter, or of any external cauſe being inſtrumental in the tranſmutation. We have ſent this clay and duſt, ſome of it, to your honour, that it may be conſidered by ſome, that have more underſtanding in the works of nature than ourſelves.

THERE were at a town, with us called *Killingsworth*, divers perſons taken with a violent purging, very like to die. In their diſtreſs they voided ſtrange worms, worms, that had legs, and were like caterpillars, not paſt an inch long. When the worms (of which no perſon, though in extreme danger of death, had above one) came away, the ſick became immediately well.

WHEN the ſmall-pox was very rife, and raging, and mortal too among us, I was put a little upon the conſideration of that diſeaſe's cauſe. And I ſhall be ſo impertinent, as to acquaint your honour, that I never could be ſatisfied with the account, which the excellent *Riverius*, Sir *Kenelm Digby*, and ſome others give. For there are many, of which it may be queſtioned, whether they had any crude menſtrual blood remaining in them (for when new-born they bled ſo at the navel, that they almoſt bled to death) who yet would have that diſtemper ſorely enough. And on the other hand, there are many never ſuffered to bleed at the navel at all, who yet would attend on the ſick, yea lye with them, and for all eſcape the ſickneſs. As further matter of conſideration here, I ſhall mention a couple of paſſages, which in *Boſton* I took notice of. One woman with child was taken with the ſmall-pox, and about the fourth or fifth day fell in travail, and was delivered of a child which had no ſign of the pox about it, yea, wholly eſcaped it. Another woman, that never had felt the mentioned diſeaſe, fell in travail, and brought forth a child full of them, the mother remaining clear.

HONOURABLE Sir, I have read of a great man, a prince, that, when his ſubjects brought every man his preſent to him, one poor man, that had nothing elſe, filled his hands with a little water, kennel water too, and made a preſent of that; yea, a preſent, that the perſon to whom it was offered looked with a very grateful eye upon. I can parallel theſe rude and imperfect communications to your honour from my ſelf unto nothing elſe. Sir, be pleaſed to accept, and I have enough.

I PRAY to the God of heaven, that he would continue ſuch a bleſſing unto mankind, as your honour's life and health; and I take leave to ſubſcribe myſelf,

Honourable Sir,

your unworthy, but

obliged ſervant,

WILL. AVERY.

Boſton, New England, May 1, 1684.

Honourable Sir,

YOUR kind letter (of Oct. 16, 1682.) with the uſeful book that accompanied it, coming to my hands, have laid me under deep obligations, which I cannot otherwiſe expreſs, than by praying to the great God, that he would fully recompenſe all your labour of love towards one ſo undeſerving as myſelf. But I muſt with ſome confuſion reflect on my own impetuoſity and importunity, for your honour's directions, diſcovered in ſome lines written ſince the date of the newly mentioned favour, that I have received from yourſelf; and as I hope, that your candour will excuſe my rudeneſs, ſo I likewiſe hope, that I ſhall never abuſe your charity.

SIR, I did on the occaſion of your letter, ſend my acknowledgments to be delivered by

the worſhipful Mr. *Dudley* unto yourſelf; but his ſudden coming away from *England* will, I ſuppoſe, cauſe the return thereof to *New England* again; and a late fit of long ſickneſs hath made it thus long, *&c.* I renew the teſtimonies of my gratitude unto your honour; neither have I been willing to venture things of this nature by any but a truſty hand.

SIR, my greateſt ambition, when I firſt ſought after the liquor alkaheſt, was, that I might attain the arcanum corallinum, and be able to prepare the ſtone ludus; but often revolting *Helmont*'s Duelech, *&c.* I have been induced to think, that if this were once attained, we might alſo ſoon get the mercurius diaphoreticus, or horizontal gold. It would be an impertinence in me to acquaint your honour with the proceſs, that I have conceived of it, only thus much; my thoughts have been, that the ☿ of Joannes de Vigo is to be prepared with his Æ, and the fire or △ of ♀ out of the colcothar of Hungarian ♁ ſtrongly calcined and dulcified; and being dried, the liquor muſt ſo often be diſtilled from it, till it all come over in the form of a green oil, then digeſt, *&c. Helmont*, page 891, and 987. *Starkye*'s Pyrot. p. 32, 33. The ♀ being ſeparated from the green oil, the oil digeſted a month with ✱, then ſeparate the tincture from the ſalt with ∇, with this △ tincture, or △, the pulv. of Jo. de Vigo is to be impregnated, as much as it will then drink up; cohobate it then with ℞, and next with ∇ to dulcify it. Wherein I may miſs it, I beg your honour's information; as alſo concerning the ℞ that *Helmont* ſpeaks of, whether it be the common, or the liquor alkaheſt; and what doſe is to be given of it; and how much of the △ of ♀ is to be put upon ℥j of the powder?

BUT truly, Sir, partly through illneſs, and partly through ignorance, I am not an adeptiſt yet.

WE took our digeſted, or putrified matter, and in a large iron pot evaporated it, till it would (after the firſt ſpirit and phlegm) yield a ſecond ſpirit, ſharp and ſtrong: we then put it into a cucurbite with an head, and in a ſound furnace cohobated it ſeveral times. When it was cohobated eight or ten times the ſpirit was turned unto an inſipid phlegm. But we went on with our cohobations forty times, to ſee whether it would make any alteration. Finding none, we put it into a retort together with the phlegm, and by degrees of fire diſtilled off the phlegm, and changed the receiver. Then came over a white ſpirit pretty ſalt; after that came over another ſalt cleaving to the ſides of the receiver, as alſo a yellow fatty matter, which ſunk to the bottom of a little dirty ſpirit that came over with it (as we had it in ſome former trials) leaving much fixed ſalt in the caput mortuum. *Helmont* in his Duelech, Ch. III. ſays, that he putrified—in an horſe—belly; and then renewed his diſtillation, and cohobated four times according to *Paracelſus*'s preſcription, and left very little fixed ſalt in the caput mortuum; which diſeaſe of his I have always taken to be of the liquor, becauſe he ſays, when the ſecond ſpirit comes, rejoice!—Then learn to diſſolve the ſtone ludus! I have more matter in digeſtion in large glaſſes, in horſe-dung, with a purpoſe, if the Lord pleaſe, to make further trials. I am ſtill at uncertainties, and therefore do thus addreſs your honour!

SIR, I remember, that *Starkey* (in Pyrotech) gives a very high encomium of the ens of ♀ for the cure of fevers, ſaying, it is prepared out of the dulcified colcothar of ♁ with the volatile ſalt of ☉ bereaved of its fætor, naming *Helmont* in his tract Butler. I have therefore, as I could underſtand *Helmont*, taken the reſiding ſalt out of the ∴ of ſea-ſalt, with warm water, and evaporated in part, adding thereto the volatile ſalt, and therewith impregnating the colcothar; which being gently dried, I have often repeated the imbibition. We have a ſublimation that is of ſome uſe, but not ſuch as anſwers deſires. *Helmont* ſays, it was ordained of God for the relief of the poor; and if the moſt High ſhall incline your honour to inſtruct me further in this alſo, I purpoſe, that the poor ſhall freely have the comfort of it.

SIR, there hath been great report concerning the balm of *Gilead*; and I have been careful both to ſee it, and to read the paper concerning it. Doubtleſs it was a forgetfulneſs in the gentleman to ſay, that this was one of the preſents made to *Solomon* by the queen of *Sheba*, as may be collected from Gen. xxxvii. 25. and xliii. 11. And though the word there called balm, may be underſtood of ſome other gum, yet might it alſo be the balm for ought that appears to the contrary. But I fear, that what is now ſold, is another thing; and therefore I have ſent you a little matter much like it, for trial's ſake. It comes out of the fir-trees in the ſpring time, in little bliſters. Perhaps it may be fitly called liquid frankincenſe; its long keeping alſo may have ſomewhat thickned it.

AND now I am objecting, the learned Dr. *Willis* I would be ſo bold as a little to animadvert upon.

HE treating of the ſcurvy, ſays, that it is much of a fixed ſalt gathered in the blood, that makes it ſo thick and black; whereas I have obſerved, that if a fixed ſalt be put into warm blood, it makes it of a more freſh and lively colour, and much more thin and fluid. He ſays too, that wine contracting a fixed ſalt grows ſour, and becomes vinegar; whereas a fixed ſalt keeps wine or beer from being ſour, eſpecially lixivial ſalts, that are the moſt fixed do abate much, if not take away the ſharpneſs of vinegar.

SIR, I had lately ſent me a paper incloſed in a letter from a reverend perſon, that relates to the ſickneſs and death of a woman, together with ſomething very remarkable, which I have entreated my worthy friend Mr. *Thomas Brattle*, to preſent unto your honour, with one of the coagulums therein ſpoken of.

I DID

I DID ſend to your honour laſt year divers ſorts of marchaſites and minerals, and letters concerning them; but I cannot tell, whether any of them ever came to your ſight. And I now intreat your honour to accept of a ſmall book, referring to remarkable providences that have happened, eſpecially among ourſelves, in the peruſing whereof I hope yourſelf will meet with ſomething, that may be not ungrateful.

HAVING thus far treſpaſſed, I do with hearty prayers for your honour's health take leave to ſubſcribe myſelf,

Honourable Sir,

your much obliged ſervant,

WILLIAM AVERY.

POSTSCRIPT.

Honourable Sir,

I THOUGHT it convenient to take this opportunity, further to be ſo rude in my addreſſes to your honour, as to requeſt, that ſince I have a ſon of my own about thirty years of age, a perſon of good repute, and a practitioner in phyſic, and an aſſiduous labourer at the chemical fire, I might have your honour's leave to let him, under due obligations, know what things your honour favours me with the imparting of; the grant of which liberty will be an additional kindneſs to,

SIR,

your devoted ſervant,

W. AVERY.

Letters from Mr. William Mainſton, *to Mr.* Robert Boyle.

London, Eſſex-ſtreet, at the two *Golden Falcons*, Dec. 19, 1682.

SIR,

MY due ſenſe of the great honour, you were lately pleaſed to vouchſafe me, commands not only my preſent acknowledgment, but inſinuates a perpetual obligation; which I ſhall ever be ambitious to teſtify, whenſoever my kind fates or your noble commands may capacitate and animate me by a ſuitable opportunity. In hopes alſo of a ſhort vacation for the conſummation of my Malayan grammar, I humbly beg the return of that impoliſhed ſpecimen; which, when plenarily tranſcribed, ſhall repreſume to implore your gracious cenſure for itſelf, and,

SIR,

your honour's moſt obliged

and faithful ſervant,

WM. MAINSTON.

London, Bell-Savage-yard, on *Ludgate-hill*, May 15, 1683.

SIR,

TO your honour's hands, as the great patron of languages and arts, this impolite grammatical tract of the Malayan Dialect preſumeth to make its ſubmiſſive addreſſes, and to ſtand the fate of your judicious and impartial cenſure; who have judgment enough to correct any faults, and goodneſs enough to pardon all; nor dares this pigmy, without ſuch aſſurance, attempt a publick expoſal in this critical, humorous, and fanciful age. The ſucceſs of this previous manual will much contribute to the animation or abortion of my impregnate intentions for a Malayan Dictionary, and the tranſlation of the ſacred Evangely, *&c.* into thoſe Oriental idioms. But ſince it is your honour's countenance and favour only, that can give life and being to this, or them, I humbly ſubmit it to ſeek its happy or unhappy fortune from your doom, as deeming my ambition gratified, if I may attain a gracious admittance into the catalogue as,

SIR,

your honour's moſt humbly devoted

and faithfull ſervant,

WM. MAINSTON.

Mr. William Huſſey *to Mr.* Boyle.

May 8, Saturday 11 o'clock morning.

Honourable SIR,

I MOST humbly pay my thankful acknowledgments for ſeveral favours, in particular to myſelf, and relatively to Dr. *Huntington*, for ſome *Grotius's* in Arabic lately, which the bookſellers could not furniſh. I have a letter from the doctor, April 28, at *Dublin*, deſiring the Iriſh preface to the Iriſh bible, without which he cannot bind them up. I know no where elſe to addreſs; and therefore moſt humbly beg your commands to ſome ſervant, to acquaint me by the penny poſt, whether it be finiſhed, and whether your favour will extend to furniſh him, and what you ſend ſhall be immediately tranſmitted to him. Honourable Sir, I beg pardon for the preſumption, and wherein I can be accountable for the trouble. I am with all humility,

Your lordſhip's

moſt devoted ſervant,

WILLIAM HUSSEY.

A LETTER directed to me *W. H.* merchant, in *Mark Lane*, will not fail to find me.

Letters from the biſhop of Corke *to Mr.* Robert Boyle.

June 12, 1683.

SIR,

COMPUTING with myſelf, that there is a week expired ſince I wearied you (as I may preſume) with my impertinent company, I begin to hope by this time you have recovered the fatigue: and though I cannot yet afford to reform being troubleſom to you, becauſe I ſhould then miſs of the valuable benefit I propounded to myſelf by acceſs to you, yet I will as much as may be ſhorten your trouble. I therefore humbly deſire you will be pleaſed to morrow, about ten of the clock, when I ſhall wait on you, to order ſome ſervant of yours to ſhew me your laboratory. By this means you will give me a great ſatisfaction, and eaſe yourſelf of a many pitiful queſtions, that would be aſked of you by,

SIR,

your very affectionate honourer,

and humbleſt ſervant,

E. CORKE ROSSE.

Corke, March 22, 1687-8.

Honoured SIR,

I CANNOT but retain a very pleaſing memory, and make ſweet reflections on that ſhort and little converſation I had with you while in *England*, in the year 83. And I had ſooner paid my acknowledgments, but that partly I did not well know how to direct to you, and partly did not think the mere compliment of a perſon ſo unſerviceable to you as myſelf worth the poſtage: but meeting with this fair advantage, I would no longer forbear to give it you under my hand, that I can ſcarce recollect any time, which I now account better ſpent, while I was in *London*, than that which I employed in viſiting you. Nor can I forget ſome perſons, who had been formerly only retainers to you, from whom I learned divers excellent ſecrets. But it is ſad now to conſider, that our condition here, at the ends of the earth, is ſuch, that all thoſe gay thoughts are ſcattered; and inſtead of improving knowledge, we think of (whether we will or no) how long and by what means our throats may be ſecured; or rather we commit all to God, for we can imagine no ſecurity (as things go with us) but by his almighty hand.

I MUST break off; I have ſtumbled on this ſubject. I intended other things when I began: but it is hard not to bewray a ſenſe of that, which pinches often and ſeverely, only I ought not to have done it to you, who I am ſure pity, but I fear cannot help. Some caſes are beyond the power of art. If this lady ſtay till to morrow at eight of the clock, God willing, I will write more comfortably. If not, be pleaſed to accept of an attempt of gratitude, blaſted by penſive and uneaſy thoughts invading,

SIR,

your very affectionate ſervant,

E. CORKE ROSSE.

Letters from Dr. Robert Huntington *to Mr.* Robert Boyle.

Dublin, Jan. 12, 1683.

SIR,

WE are now, after a long, ſmart, and unuſual froſt, falling into our old Iriſh weather again: and it is the moiſture and fogginess of the air, which I more dread than any thing elſe in the country, though, God be thanked, I have not been quite ſick ſince I came; nor am yet diſſolved or broken to pieces upon the thaw. But, give me leave, Sir, to aſk you, who ſo well underſtand all philoſophy; whether the mind of man muſt not ſuffer by ſuch heavy preſſures upon his body? And really I have all along been ſenſible of ſo much native dulneſs and ſtupidity, that I need not improve it by acquiring more. If the receipt you were pleaſed to give me, will heal that diſeaſe, or prevent any farther infection, I ſhall then adventure upon uſquebaugh. If the *Dublin* Society for the improvement of real knowledge could but follow (though at a mannerly diſtance) as they endeavour to imitate the Royal Society of *London*, I would then hope to breathe, even in *Ireland*, a better air. And here let me tell you (which perhaps is news) that there is ſuch a company aſſociated; and that they would be extremely proud of your directions and encouragement. You know ſome of the number, the biſhop of *Fernes* and *Laghlin* (who now ſends concerning the Iriſh bible). Sir *William Petty*, Dr. *Willoughby*, and Dr. *Malin*: the latter has been long abſent, being ſent for a great way off, to cure ſeveral perſons tormented with the gout; and upon this account perhaps it is, that he writes not to you. But I treſpaſs more, I fear, the other way: and therefore begging your pardon for my many and bold addreſſes, I commit you to the divine protection, and remain,

Noble Sir,

Your moſt humble ſervant,

ROBERT HUNTINGTON.

Jan. 24, 1684-5.

SIR,

I WAS lately ſpoken to by virtue of a commiſſion from yourſelf, concerning the Iriſh tranſlation, whether the emendations of Mr.

Rely

Rely were properly ſuch. To this I had returned an anſwer upon the firſt receipt of the proof, and told the judgment of ſome here very well verſed in the ſaid language, who approve it as well done. But now, ſince you require new information, I have lodged it in the hands of the biſhop of *Meath*, who promiſes me the opinion of a miniſter in his dioceſe, and as impartial an account as any Romaniſt can be ſuppoſed to give us. As ſoon as I recieve it, it ſhall be ſent with all due care and reſpect by,

SIR,

your moſt obedient ſervant,

ROBERT HUNTINGTON.

Feb. 21, 1684-5.

SIR,

WHEN I laſt anſwered your enquiry concerning the approbation of your corrector's amendments, I intimated, that the biſhop of *Meath* had particularly recommended it to the peruſal of one of his clergy, who generally allows it, and has drawn the incloſed ſcheme of what he thinks would be but in the proof you were pleaſed to ſend: and herein, if it were worth the while, you might take Mr. *Rely*'s judgment of him, as you have his of Mr. *Rely*. The tranſlation was made ſome time ſince; and conſequently there may be ſome variation in the language by this time, though very little comparatively to what is found in the neighbouring tongues, who write and print ſo much, and expreſsly for the improvement of their languages; which I never expect ſhould be done in the behalf of Iriſh. May the inhabitants make uſe of thoſe books, which with ſo much piety and expence you procure for them! and it is the beſt employment the tongue can be put to. As for their legends, both ſacred and civil, the fabulous lives of ſaints, and the rhodomontado's of hiſtory, if they are no better than father *Creſſy* and father *Walſh* affords us, I ſhall hardly think it worth the while to learn Iriſh, that I may read them.

SIR, it is the opportunity I met with to convey the incloſed, which has occaſioned you this preſent trouble from

Your moſt humble ſervant,

ROBERT HUNTINGTON.

March 24, 1684-5.

SIR,

I PERCEIVE you reſolve to engroſs the honour of a gallant work wholly to yourſelf; and may the ſucceſs be as great as the undertaking! If our liturgy were likewiſe tranſlated, we ſhould wholly remove from ourſelves, what we charge the Romaniſts withal, the locking up of our religion in an unknown tongue, and perhaps invite thoſe, who are fond enough of their language, to underſtand our devotion. Now, Sir, whether againſt the accompliſhment of ſuch a laudable deſign, you may not think it conducive, as the pſalms are printing off, to print ſome ſupernumerary hundreds of copies in a leſſer volume, before the letters are diſtributed; which may upon occaſion be appended to the common-prayer book? Or if it ſhould ſo happen, that this be not quickly done in Iriſh, yet is the pſalter of itſelf a pretty manual, and moſt fit for beginners.

How far the publick will intereſt themſelves in the encouragement hereof by any ſolemn act, I cannot determine. And by reaſon of the late alterations in our government, it may not be ſo ſeaſonable at preſent to urge it. As opportunities ſhall offer, I have deſired ſome of better credit to manage the affair, and accordingly you ſhall receive information from,

Noble Sir,

your moſt humble ſervant,

ROBERT HUNTINGTON.

March 20, 1685-6.

SIR,

THE fifty copies of your Iriſh bible arrived but lately; the preface and title page are not yet arrived, though I have heard of them: and till thoſe come, I ſhall defer the preſents you are pleaſed to make, becauſe they will otherwiſe want a viſible part of their ornament. In the mean time, and the firſt that was bound, I carried to my lord lieutenant, and begged his encouragement of ſo good a work; which he readily promiſed, both for its own ſake, and for yours, that the nation may know at preſent, and the generations to come, how much they ſtand indebted to ſuch a noble benefactor.

I HAVE them very well bound in calf's ſkin for fifteen pence a piece, beſides the ſaving of a great cuſtom: ſo that if there ſhall be any occaſion for more, it will ſtill be the beſt way to ſend them in ſheets. We are not under ſuch circumſtances, as may encourage me to believe the Iriſh will be very fond of this tranſlation: however, it muſt be known you have done more for them than all their prieſts ever did; and the reaſon is plain, becauſe your deſign and theirs is mighty different, you intending nothing elſe but to make them knowing and wiſe unto ſalvation. I am, Sir, with all imaginable reſpect,

Your humble and

obedient ſervant,

ROB. HUNTINGTON.

Letters

Letters from Sir James Tyrrell *to Mr.* Robert Boyle.

Okely, Jan. 23, 1684-5.

SIR,

I MUST beg your pardon, if the ſeverity of the ſeaſon, and ſome other employments of the workman have hindered him from digging, and me from ſending thoſe clays you deſired, till now by this bearer. I ſuppoſe theſe are all you deſired, or the place affords, *viz.* the blue, red, and white, and that the laſt is the ſame you meant; and if it ſhould not prove ſo upon trial, I ſhould be ſorry, becauſe the old potter (who I ſuppoſe is the ſame, that ſhewed it you) does not know of any other: there is about ſix or ſeven pound of a ſort, and if you deſire more you may freely command it upon the leaſt notice. I muſt likewiſe aſk your pardon, if the illneſs of the weather, and ſhortneſs of the days, have deterred me as yet from experimenting the weight of the atmoſphere, with a tube inſerted into a vial of water; but when the weather and ways prove more favourable, I will not fail to mount the neighbouring hill I told you of; and having tried it, will let you know the ſucceſs, either by letter, or when I have next the honour of waiting on you. In the mean time I have nothing more of natural productions to acquaint you with hereabouts; but that I have riſing in my land a very ſtrong vitriolick water, which is good for fiſtulas, and ulcerous ſores. A chemiſt of my acquaintance at *Oxford* has tried ſome of it, and finds a great quantity of white vitriol may be extracted out of it; if you pleaſe to command any of it, I ſhall ſend you up what proportion you pleaſe when the weather is drier, it being now too much diluted with the rain water. So with many thanks for your liquid phoſphorus, but above all for the happineſs of your moſt excellent converſation when I was in town, I remain,

SIR,

your moſt humble,

and faithful ſervant

JAMES TYRRELL.

IF you have any occaſion to lay any farther commands upon me, you may direct your letter to be left with *Robert Clarke*, under-butler of *Queen's-College*.

June 22,

SIR,

FEARING a ſudden alteration of the weather from dry to moiſt, I have now ſent you a large bottle of my vitriolick water (as you deſired) whilſt it is in its full ſtrength before it be diluted with the rain. I deſire your operator would diligently examine two particulars concerning this water; the one, whether it be at all arſenical: for ſome poor people hereabouts take it, and it makes them both vomit and purge exceedingly; and if there be no arſenick in it, it may prove a very good and ſafe vomit for the poor: the other is, whether or no there may not be extracted out of it a white ſalt of vitriol, which might be made with leſs trouble and charge than that, which the chemiſts uſually prepare: and I myſelf have taken it for a vomit more than once with good ſucceſs. The dry leaves, and banks about this pool, betray a great deal of this white vitriolate ſalt; for it now ſticks upon them concreted in a pretty good quantity, as I could ſhew you, but that I fear it would rub off in a paper; and it were not worth while to ſend you any in a box, unleſs you particularly deſire it. I have likewiſe ſent you ſome few notes upon your titles of the air, which you were pleaſed to truſt me with; in which I do not pretend to give you any thing you do not know already concerning the air in general: and therefore I do rather confine myſelf and ſome particular obſervations I have made concerning the air and weather hereabouts; which I ſuppoſe may hold true of all other places of like ſituation. And if I can tell you nothing new on this ſubject, yet it would be a great ſatisfaction to me to have thought the ſame way with ſo great a genius in natural things, as I ſhould be much prouder, if there be any thing, which may ſeem uſeful to you in the proſecution of this noble deſign you are now upon; in which, as in all other endeavours for promoting of uſeful knowledge, none can wiſh you better ſucceſs than,

SIR,

your moſt humble ſervant,

J. TYRRELL.

IF you pleaſe to lay by your obſervations concerning this water till towards winter, that I come to town, it may ſerve; or elſe if you have any thing further to command me, you may direct your letter to me at *Okely* in *Bucks*, to be left with *Robert Clarke*, under-butler of *Queen's-College*, *Oxon*. I return you many thanks for your excellent treatiſe, which I have peruſed with great ſatisfaction.

Okely, May 25, 1687.

SIR,

IN obedience to your commands, I have here ſent you that part of Mr. *Locke's* letter, which relates to his opinion concerning Mr. *Burnet's* new Theory of the Earth, which I hope will anſwer your expectation: and ſince you have been pleaſed to give me encouragement to hold correſpondence with you concerning natural things, and particularly of

the air, I ſhall make bold to remark (if you have not already obſerved it) that the great wind on the late ſtormy Friday did not only break down the arms of divers great trees, but alſo blighted and burnt up the leaves of the trees, and blades of corn in divers places; from whence I obſerved, that thoſe peſtiferous particles, which we call blights, are not only brought upon us by gentle eaſt, or ſouth-eaſt winds, but alſo ſometimes with a weſtern wind, and ſtormy weather, as this then was. Nor have I any thing elſe to add concerning this ſubject, only that this day is alſo very ſtormy weather, often intermixed with ſhowers of rain, ſo that my barometer ſtands now at near about two degrees above much rain, which I beſeech God to grant us, for we have great need of it in the country. I have procured ſome rotten wood, as you deſired, but have deferred to ſend it, becauſe I cannot find that any of it does ſhine in the dark, which I know is the only thing you deſire it for. I cannot tell where the fault lies, whether in the ſort of wood (they being only crab-tree and ſallaw) or elſe in the drineſs of the ſeaſon; but if you pleaſe to command it as it is, and will let me know your pleaſure in a line or two directed to me at *Okely*, near *Brill* in *Bucks*, to be left with *Robert Clarke*, under-butler of *Queen's-College*, *Oxon*, your commands in that, as in all other things, ſhall be exactly obeyed by,

SIR,

Your moſt faithful,

and humble ſervant,

JA. TYRRELL.

MY mother is well, and is much my lady *Ranelagh's* and your humble ſervant.

Mr. *Locke's* is as follows.

[THE *New Theory of the Earth* I have read in Engliſh, and cannot but like the ſtyle and way of writing upon thoughts wholly a man's own; but ſince you deſire my opinion, as to the treatiſe itſelf, though it be a good while ſince I read it, and that but curſorily; yet there ſticks with me ſtill ſome of thoſe objections, which roſe in my way as I peruſed it, and which offered themſelves againſt the truth or probability of his hypotheſis, which made me not able then to reconcile it either to philoſophy, ſcripture, or itſelf. In the firſt part (as I remember) he makes the globe of the earth round, both by its ſchemes and hypotheſis of its formation; and in the ſecond part oval, without giving (as I remember) any reaſon for it. He makes the circulation of the water to be drawn up by the ſun as now, but all the clouds to go and empty themſelves at the poles only. How he makes out the phyſical reaſon of this motion, I do not well remember, but this I am ſure of, by this means there could be no rivers; for all the water that ſhould fall in thoſe parts he deſigns for it, muſt needs in that ſtate he puts the world in (the ſun being conſtantly in the equator,) muſt needs have fallen frozen, and ſo remained in mountains of ſnow. But granting water, though without a ſea, where lived the whales mentioned in the creation? But that, which ſeems to be the principle of his deſign, to make out (*viz.*) the hiſtory of the Flood, is that methinks, which he hath leaſt ſucceeded in: for when this cruſt of earth broke, what hindered the broken pieces from ſinking down into the abyſs, and ſo being quite loſt under water? And if the middle of the world, which lay under the ſun, was that, which firſt failed, how comes it, that we find ſo much of the torrid zone above water? But if we may judge by the Andes (one of the higheſt and longeſt tracts of hills in the world) the crack (if there were any) ſeems to run the other way: but that which ſeems moſt incomprehenſible of all is, how the water, that is now in the world, and was in his account no more then, could cover the tops of the higheſt hills, and remain above them ſo long a time as *Moſes* mentions; for the flaſhing of it, upon the falling in of the earth, (which is the cauſe he aſſigns) will be found (if conſidered) impoſſible to raiſe them ſo high, much leſs to continue them there ſo long. I imagine, if I ſhould trouble you with my fancies, I could give you an hypotheſis would explain the deluge without half the difficulties, which ſeem to me to cumber this; but though I tell you, that I am not convinced of his doctrine, and have here ſent you ſome of thoſe doubts, which I had in reading of him, which is now almoſt two years ago; yet I muſt alſo aſſure you, that there are ſome chapters in him, that I cannot enough value, and the book is to be eſteemed were it for thoſe only.]

SIR, I doubt not of your prudence in communicating theſe obſervations without naming the author, ſince I would not have done ſo much without his order, for any but a perſon, for whom I know he has ſo high a reſpect.

Letters from Mr. Ja. Dalrymple, *to Mr.* Robert Boyle.

Leyden, October 29, 1685.

Right honourable,

I HAVE ſent you herewith a treatiſe dedicate to the Royal Society. The meditation of the wonderful work of God in the ſtupendous contrivance of the inſcient powers of nature, hath been the delightful diverſion of my mind for many years. I have been a great admirer of your piety and your parts, ſince I firſt had the honour of a little acquaintance by the mediation of your excellent friend and mine, Sir *Robert Moray*. I have therefore made bold to trouble you to preſent it to your Society, whereof I wiſh to

have the honour to be a member. If you find ground upon peruſal, recommend it to your friends and to ſtationers, and let me by a line know your thoughts of it: you may deliver your letter to the bearer, who *will convey it to,*

SIR,

your moſt affectionate,

and moſt humble ſervant,

JA. DALRYMPLE.

Leyden, March 2, 1686.

Right honourable,

I DID in December laſt ſend a philoſophical treatiſe dedicate to the Royal Society, and I wrote a line with it; but the gentleman, to whom I intruſted it (upon miſtake being taken for another perſon by the waiters at *Harwich*, who was ordered to be ſeized) was apprehended, and that book and ſome others ſent to other friends were taken from him, and put in the Cuſtom-houſe at *London*. The gentleman fell ſick, and I heard no more what became of the book or your letter. I was the more confident to preſent it to you, and thereby to the Society, that I have the honour of a little acquaintance of you by your friend and mine Sir *Robert Moray*; and beſide I have ever had a high eſteem of you, and have made much uſe of your experiments; and have not neglected on all occaſions to mention it with that honour, that you do eminently deſerve of the learned world. There is a parcel of them ſent to be ſold at *London*; they have met with good acceptance elſewhere. I ſhall think myſelf happy, if my thoughts fall to quadrate in any meaſure with yours; and the approbation or ſatisfaction of that learned and noble Society will be a great encouragement to me, to proceed in the more ſpecial parts of natural philoſophy, which hath been long the delightful recreation, and now in my retirement the main exerciſe of,

SIR,

your moſt affectionate friend,

and humble ſervant,

JA. DALRYMPLE.

Letters from the counteſs of Warwick *to Mr.* Robert Boyle.

My deareſt, deareſt brother,

I AM extremely ſenſible, that ſo obliging a favour, as your giving me a viſit at *Lees*, deſerves an acknowledgment; but which way to expreſs my ſenſe of it I know not; but I am confident, you are too well acquainted with my dulneſs to expect I ſhould do it handſomly, at a time when I am moſt pleaſed and compoſed; and therefore will not, I hope, do it now, that I have ſo juſt a cauſe of diſorder, as ſo lately parting with a brother, for whom I have ſo great an affection, that the loſing your company is ſo ſenſible an affliction to me, that if I were not comforted with your promiſe of returning to *Lees*, I know not what would become of,

Your affectionate ſiſter,

and moſt humble ſervant,

M. WARWICKE.

CHARLES is your ſervant, and all the young ladies, but eſpecially your miſtreſs, who had two fits the day you left *Lees*. Pray preſent this letter to my fair friend my lady *Roberts*.

My deareſt, deareſt ſquire,

WHEN I hear from you, it brings me too great a joy not to tell it. Really, my dear ſquire, I muſt confeſs myſelf to be guilty of ſo much ſelf-love, as to read of your being pleaſed at *Oxford* with ſome regret, becauſe I am ſo much my own friend, as to deſire with great impatience the ſatisfaction of ſeeing you here, the hopes of which, I may with a great deal of truth ſay, was the greateſt motive I could uſe to myſelf, to perſuade me to be willing to leave the ſweet quiet of the country, for the horrid confuſion of the town, in which, now my dear ſiſter *Ranelagh* and you are out of it, I have very little to pleaſe me in it, though we are like to be very great, for the lad is like to be a ſucceſsful lover. My lady *Devonſhire* is, God be thanked, like to recover. I envy the counteſs, who will be ſo happy as to ſee you, and deſire, when you are together, you will wiſh with you,

My dear ſquire,

your affectionate humble ſervant,

M. RICH.

MR. *Rich* is your ſervant, and my lady *Warwicke* preſents her ſervice to you: my ſervice to my nephew, and pray tell *Dick Jones*, that though I writ a letter to him, I never heard a word from him.

Lees, July 30.

My deareſt, deareſt brother,

MY being laſt week engaged in a viſit to my lady *Barington*'s, made me too weary, when I returned from it, to write that night by *Bellchamp*, and to tell my dear ſquire, how much I was really troubled to find my ſiſter return without you; for though I muſt confeſs, that I was not without ſome fears, that you would not come, yet I had entertained ſuch hopes of it, as made it very uneaſy

eaſy to find myſelf defeated in that, which was ſo really conducive to my happineſs, as your company was; but I was much more ſtruck, when my ſiſter informed me, that your not being well was the reaſon, that kept you from me, and truly was very impatient till the next return to hear how you did, for there is no creature living has a greater deſire for your health and happineſs. This I muſt beg you to do me the juſtice to believe, and to ſtill continue your kindneſs to her, who has as great a one as is poſſible for you, being with all the ſincerity imaginable,

My deareſt brother,

your moſt affectionate ſiſter,

and humble ſervant,

M. WARWICKE.

MY lord and the young ladies are your ſervants.

Lees, Dec. 29.

My deareſt, deareſt brother,

MY lord privy ſeal, as ſoon as he came in hither, told me, (I think to be ſure of being welcome, the good news) that you would be here this Chriſtmas, which was ſo pleaſing to me, that I was thinking with great delight upon that happineſs I hoped ſo ſoon to be poſſeſſed of, when a letter from you was brought me, that I opened with great haſte, hoping to find a promiſe under your own hand of your ſpeedy coming: but alas! to my great grief, I found all my expectations daſht, by your telling me, that your occaſions would not permit you to ſatisfy my longing expectation to ſee you. But my dear ſquire, I hope, and do comfort myſelf what I can with the hopes, that though you could not at this time, yet you will ſuddenly diſpatch all your affairs, that you may come to *Lees* to ſtay ſome time with me; and to encourage you to this, I will aſſure you, that you ſhall be abſolute maſter of your own time, and that no interruption ſhall be given you by,

My deareſt brother,

your affectionate ſiſter,

and moſt humble ſervant,

M. WARWICKE.

I HAVE told my fair friend what you ſaid in your letter to her; but I find her ſo kind to you, that for fear of making you too proud, and her lord too jealous, I will not repeat what kind things ſhe ſays of you. I thank you for my book; I am much pleaſed with what you have added to it; and am very glad my old friend *Tom Murray*'s letter was the cauſe of it. I am confident his letter was worth ſeeing.

Letter from the counteſs of Corke *to Mr.* Robert Boyle.

Liſmore, June 26.

My dear brother,

THOUGH I confeſs I have been a great while ſilent, I ſhall not fear you will conclude me faulty, but rather civil in that forbearance, ſince all that was neceſſary or worthy your knowledge, I know you received weekly by better hands from this place. To trouble you then to anſwer my inſignificant letters, I doubted would be a burthen your civility would impoſe upon yourſelf, and this has been hitherto the true ground of my ſilence. What is now the preſent motive of my writing is, to beg your opinion of your nephews paſſing their times, and whether they improve them to their moſt advantage, where, in the firſt place, it is moſt neceſſary they be well grounded in piety, which is the chief bulwark to preſerve them from thoſe temptations their age, condition, and converſation (too general in the world) is likely to aſſault them withal, eſpecially in their travels, to which my lord before long deſigns them. And therefore I humbly beg you would make choice of ſome good books, and recommend them to their peruſals, and to the doctor to ſuperviſe and clear, what may ſeem obſcure to them in that ſtudy, to which all their other ſtudies ought to ſtrike ſail, and to that chiefly intend; in order to which, I know nothing more probable to perſuade them, than your good precepts ſeconded with your example and practice. This ſhall be the chief intent of this letter, though I could much inlarge it with reſentments of my near approaching unhappineſs in parting with my deareſt ſiſter, did I not conſider, that this deprivation reſtores to you a happineſs I muſt not grudge you, but ſtudy rather the means to haſten over to be a ſharer in your mutual ſatisfactions, till when my complaints muſt keep home; and I ſhall only here trouble you with the inſignificant, yet very ſincere and hearty profeſſions of my ever remaining,

Dear brother,

your moſt affectionate, faithful,

and obliged ſervant,

E. CORKE.

I BEG you to preſent my ſervice to Dr. *Willis*, when you ſee him.

Letter of Mr. Charles Boyle, *afterwards earl of* Orrery, *to Mr.* R. Boyle.

SIR, July 31.

I WOULD have paid my reſpects to you before now, but I have not long been ſettled here in *Oxford*. I am at *Chriſt-church* under the care of Dr. *Aldrich*, who is dean of the college, an extraordinary man, a great ſcholar,

ſcholar, and of a very good temper. I do not queſtion but I ſhall get what I aim at here, which is a competent ſtock of learning and good ſenſe: I will do my endeavour. I hope you will pardon this rudeneſs in troubling you with this my impertinence, for I thought it my duty to ſhow you, that I am,

SIR,

your obedient nephew and ſervant,

CHARLES BOYLE.

I MUST trouble you with my duty to my aunt *Ranelagh*.

The lady Clancartie *to Mr.* Ro. Boyle.

Nov. 19.

Dear uncle,

IF it had been poſſible for any thing to have made an addition to the great proportion of ſorrow, your letter found me under for the greateſt of cauſes, it would have been to find thereby, that you were indiſpoſed. But I hope your indiſpoſition of body will not be of ſo long continuance as mine of mind will, God having pleaſed to lay me under a ſevere exerciſe of my patience, by taking from me the greateſt comfort. And indeed I cannot be juſt to his memory, without ſaying he was in all reſpects qualified to make me and mine happy, and very capable to have ſerved his country and the proteſtant intereſt, which I am ſure he had real reſolutions to have done to the utmoſt of his power; and therefore you are very juſt in the opinion you had of him, who had a very great reſentment of the kindneſs you were pleaſed to ſhow him, when he was in *England*, and would often ſpeak with great reverence for your judgment in every thing; and was faithfully your ſervant, and ſo good a man in all reſpects, that I am ſure he is perfectly happy, which is the only thought, that affords any conſolement under the ſad circumſtances of,

Dear uncle,

your moſt obliged humble ſervant,

and affectionate niece,

E. CLANCARTIE.

I BEG my moſt humble ſervice to my aunt *Ranelagh*.

Letters from Dr. Burnet *to Mr.* Robert Boyle.

At the *Hague*, Jan. 3, [1686. O. S.]

Honourable Sir,

SINCE I know this noble bearer will have the pleaſure of waiting ſometimes on you and on my lady *Ranelagh*, I could not ſatisfy myſelf with charging him to make you both all the expreſſions poſſible of my duty and eſteem for you, which I hope he will perform with that grace, that accompanies him in every thing, that he either ſays or does; but I took the liberty to write by him, and ſince I am upon a ſubject that pleaſes me ſo much as Mr. *Cutts* does, I crave leave to tell your ſiſter, that if I durſt ſay it, I am almoſt angry with her, for having known ſo worthy a gentleman without giving me a ſhare of it, ſince I find he has had the honour of being known to her a great many years; but quarrels of this nature do not go very far. I am ſure I ought to have none with you, after you have obliged me by the preſent of your excellent book of nature. No man knows her ſo well as you do, and ſo no man ought to have undertaken her ſo boldly; and indeed you have managed it ſo, as to maintain the noble character of a Chriſtian philoſopher, which I am ſorry is ſo peculiar to yourſelf, ſince moſt of our philoſophers ſeem to forget, that they are Chriſtians. I wiſh you and your incomparable ſiſter a good new year, together with a great many to come after this, that mankind may be ſtill made better and wiſer by your means. I am with as much reſpect and veneration, as I can pay to any mortal,

Honourable Sir,

your moſt humble

and moſt obedient ſervant,

G. BURNET.

Hague, June 4, [1686.]

Honourable Sir,

THOUGH I have not during ſo long and ſo uneaſy an abſence from a perſon, whoſe converſation was always equally delighting and advantageous to me, taken the liberty to write to you, yet as I have often procured to myſelf the ſatisfaction of hearing concerning you, ſo you will ſee by a bundle of papers, that the bearer brings you, that I had you always in my thoughts; and that therefore I have writ as full an account, as I thought was neceſſary, of every thing, that occurred to me in my travels, in five long letters, which you will ſee by the concluſion of the fourth, are addreſſed particularly to yourſelf. I ordered my man to carry them firſt to the dean of *Pauls*, who, I know, will very ſoon diſpatch them, and then he will bring them to you; and if they give any agreeable entertainment to you or your noble ſiſter, I will attain one of my main ends in writing them. I am extreme ſorry to hear, that my lady *Ranelagh* has of late had ill health; but I hope the ſeaſon of the year will ſet her up again. Her life is ſo important, and has been of late of ſuch uſefulneſs to a great many, who have felt the effects of her univerſal and active charity ſo ſenſibly, that I hope God will yet continue ſo great a bleſſing to an age, that may very ill want ſuch patterns. I give her my moſt humble ſervice in the moſt particular

ticular manner, that can be imagined. But having condemned you to the reading ſo many ſheets, it were very unjuſt to add a farther impoſition upon your time; therefore I do only beg of you to ſend theſe ſheets, when you have done with them, to my lady *Eſſex*, who is to ſend them to my lady *Ruſſel*, and after they have made a little turn, they will return them back to you, to be diſpoſed of as abſolutely by you as the author of them, who will ever be in a manner beyond expreſſion,

Honourable Sir,

Your moſt humble,

moſt obedient, and

moſt obliged ſervant,

G. BURNET.

MR. *de Tournes* of *Geneva*, who reprints all the Latin tranſlation of your works, gave me the incloſed memorandum, which I take the liberty to ſend you, for he is a very worthy man.

Mr. Boyle's *anſwer to Dr.* Burnet's *letter of June* 14, 1686.

SIR,

A GOOD while ſince I received the letter your domeſtick delivered to me: I received a greater favour in that of a roll of excellent papers, that was ſent me a few days ago by the dean of *Paul*'s. They ſhould at any time have been very welcome, but are more ſo by being very ſeaſonable too, to divert, as well as inform me, whilſt my ſiſter is kept in her chamber by the remains of a feveriſh diſtemper, and am I laid up by ſomething, that though ſeemed to be an effect of the ſcurvy, does very much emulate the gout: by which melancholy juncture of circumſtances, ſhe and I, though in the ſame houſe, and neither of us (thanks be to God) confined to a bed, have not ſeen one another theſe four or five days. Though your delightful travels have much alleviated the troubleſomneſs of a diſtemper, that keeps me from ſtirring, yet they have left me pain enough to keep me from being able to make you thoſe returns for them; I ſay not, that they deſerve, but that in other circumſtances I ſhould not perhaps be uncapable of doing. Your excellent manuſcript making me lay aſide almoſt all printed books, was my entertainment morning, noon, and night, becauſe I found I could travel through your letters, as well with more pleaſure, as with more quietneſs, than you did through the countries ſo judiciouſly deſcribed in them. Having viſited many of thoſe places in my youth, the lively mention you make of them does ſo revive my decayed ideas, that they make me think myſelf young again. I am glad to find, that all men do not travel as moſt do, to obſerve buildings, and gardens, and modes, and other amuſements of a ſuperficial and almoſt inſignificant curioſity: for your judicious remarks and reflections may not a little improve both a ſtateſman, a critic, and a divine, as well as they will make the writer paſs for all three.

* * * * * a work, that may hereafter ſerve for a faithful mirror of the times and places it was written in. As for the diſpoſal of thoſe letters, which you are obligingly pleaſed to leave me, though I be very ſenſible of the favour you do me, yet I cannot think myſelf qualified to accept ſo great a truſt, eſpecially being not ſo well acquainted with your preſent circumſtances abroad as to judge, whether ſome of your friends here have as much reaſon, as I perceive they think they have, to apprehend, that at this time (though not perhaps at another) the publication of theſe curious papers, particularly of your laſt letter, may be almoſt as prejudicial to the author, as grateful to his reader. The compliments and more kind paſſages you are pleaſed to conclude with, I dare no more pretend to anſwer, than deſerve; and therefore think the fitteſt return I can make of them is, not to permit them to make me offer you an intereſſed advice: and the beſt uſe I can make of the power you give me is, not ſo much to conſider the benefit of being ſo advantageouſly repreſented by ſuch a pen, as the ſafety and juſt intereſts of a perſon, that has ſo handſomly obliged,

SIR,

Your moſt humble, and

moſt affectionate ſervant,

&c.

THE date will inform you, that this letter was written long ſince; but a German, that brought me a compliment from you, by undertaking (without performance) to deliver this paper to you at his return from *Oxford*, has been the occaſion of this delay, which therefore I hope you will eaſily pardon. I ſhewed my ſiſter what you writ of her, and ſhe is very ſenſible of your kind, though ſhe takes exceptions at the complimental part.

Superſcribed,

A monſieur monſieur Burnet in de Hoege, &c.

Biſhop Burnet *to Mr.* Boyle.

Saliſbury, January 20.

Honourable Sir,

IT was very uneaſy to me to leave the town, without giving myſelf the honour of waiting on you according as you were pleaſed to deſire me; and I firmly intended to do it on Monday laſt. But the meſſages between the two houſes held us ſo late, that I being under engagements to go into *London* that night upon buſineſs, was kept there ſo long, that it was not poſſible for me to get back, before your

time of going to bed was paſt. I was the more uneaſy at this, becauſe I knew the affliction that you were under by reaſon of my lady *Burlington*'s condition, of whoſe death I have heard nothing; ſo I conclude, that ſhe muſt be recovered, at which I very much rejoice. I do therefore moſt humbly beg your pardon for not having obeyed thoſe obliging commands, that you were pleaſed to lay upon me, when I ſaw you laſt. It is my inclination, as well as my duty, to delight in being often with the perſon in the world, that I eſteem the moſt, and to whom I ſtand ſo highly engaged; and therefore I hope you will impute my not attending you to any thing, rather than to a ſlowneſs in obeying your commands. But if there is any thing, in which the opinion of ſo mean a perſon as I am, can add to the ſatisfaction of ſo great a perſon as I know you to be, I will not fail to ſend you a very particular account of my thoughts in any matter, that you may think fit to communicate to me, and will be ſure to loſe no time in it. I pray God to continue you long to be a publick bleſſing to the age, which you have hitherto been in all reſpects more than any man I know; which muſt needs engage all, that have any regard either to religion or virtue, to pay you a moſt particular eſteem; and as there are not many, who know more of your worth than has fallen to my happy ſhare, ſo I am ſure there is not any one perſon, that honours you with a more profound reſpect than,

Honourable Sir,

your moſt humble,

moſt obedient, and

moſt obliged ſervant,

G. SARUM.

Letters from Mr. Benjamin Denham *to Mr.* Robert Boyle.

Honoured Sir,

THOSE courteſies are to be higheſt in eſtimation, which come without a petition, *jus enim precarium fert ſecum obligationem*, ſays the Civilian. If I ſhould reveal my thoughts, that I have of your piety and worth, you would think I flatter, therefore I will be ſilent.

Omne agens naturale neceſſario operatur; the ſun cannot but diſtribute his beams, and ſo are good men; morality and grace ſo effectually operate in them, that as it were they muſt be courteous and good, and almoſt contradict the maxim, *Omne agens morale eſt liberum et indifferens.*

I HAVE here preſented to your cenſure and reading ſome of my unconcocted notions and inventions; ſome I ſay of many, *multa in paucis*; in one word I render your honour an hecatomb of thanks for ſpeaking to the lord chancellor; but if on ſome occaſion the biſhop of *Wincheſter*, who recommended me to *Conſtantinople*, had but one word from you, my cares would ceaſe, and then I might ſtudy without diſtraction. The lord biſhop of *Wincheſter* hath now always his lodgings at *Whitehall*, and is conſtantly to be found before and after chapel at noon. Your goodneſs is ſuch, that if I crave pardon, preſently I am forgiven. Your honour knows the ſtory of *David*, confeſſion and abſolution hardly had a moment's difference at leaſt. I will comment ſo at this preſent,

Your honour's moſt affectionate,

and humble ſervant,

BENJAMIN DENHAM.

SIR,

AMONG ſome of mine inventions and enquiries, one was about titles of honour to the clergy; but pray do not think I flatter or lye, if I enquire what title I might contribute to your worth and affable kindneſs, for I have found no perſon ſo diſintereſt in the world's honours and profits as your honoured ſelf, and it was that, which made me ſo deſirous of your acquaintance.

THE world, they ſay, turns round, but I am as the pole, fixed in my condition. I have received my book and your letter, which I did, as the grand viſier doth to his emperor's letter, kiſs and adore; and if there be any idolatry, I hope God and you will pardon. I hate popular applauſe, but I have preached in divers places in *London*, and in the duke of *York*'s chapel, but ſtill—*haud facile emergunt, &c.* It is the firſt ſtep and ſecond in nature's philoſophy, that helps the moſt to the progreſs. My lord keeper ſpeaks very kindly; and I would willingly contribute my endeavours to the compoſure of an univerſal catechiſm in ſuch principles, in which all the Chriſtians do agree; and Dr. *Pocock* will inform you, that if it were made in Italian, Latin, vulgar grammatical Greek and Turkiſh, it would at leaſt confirm the poor Greeks in Chriſtianity, if not convert the Turks and barbarous. I render you thanks for thoſe divine benefits, that I have received from your divine book of occaſional Meditations. I have an honeſt accuſation againſt your honour, becauſe you force me either to buy or borrow of others, which I would yourſelf had diſplayed. When I receive any revenues from the church, then I will beſtow ſome money and pains to recover that Arabic book out of captain *Kempthorne*'s hands, now returned from the ſeas, for the uſe of Dr. *Pocock*, to whom I ſent it; for hitherto I have only beſtowed my money, as well as my pains, when I preach or officiate for others, either in or out of town. My landlord Mr. *Thomas Francis*, one of the king's life-guard, hath his houſe at the ſign of the Sun almoſt againſt the *New Exchange*, where I now live; but I hope *Poeta* and *Vates* will prove the ſame as Mr. *Mede*

Mede teſtifies—*Nil mihi reſcribas, attamen ipſe veni*; but yet a few lines from your honour will be more valued by me than the χρυσεα ἐπη of *Pythagoras*. Let me meet with them either at the religious houſe of the devout lady *Ranelagh*, or at mine own lodging. I will reſt content, yea μακροθυμος, and ſatisfied with longanimity, until your honour ſhall find an occaſion to come to *London*, to ſpeak with any biſhop in my behalf.

Your moſt obliged ſervant,

BENJAMIN DENHAM.

Letters from biſhop Fell *to Mr.* Robert Boyle.

June 10.

Honoured Sir,

THE bearer hereof Mr. *Guiſe*, a gentleman of very good parts and acquiſitions, has undertaken the deſcription of *India*, for the Atlas, which is printing in this place; and being deſirous not to tranſcribe relations and journals already publiſhed, now takes a journey to *London*, to receive thoſe helps and notices, which our preſent commerce in thoſe parts can give him. As I am well aſſured, that no patronage and aſſiſtance can be of greater moment in this affair than yours; ſo I perſuade myſelf, that none will be with greater readineſs afforded. I ſhall not therefore go about to excuſe the confidence of this addreſs, or the trouble it will give you; but recommending Mr. *Guiſe* to your favour, and yourſelf to the bleſſing of almighty God, I remain with great reſpect,

Honoured Sir,

Your moſt humble,

and faithful ſervant,

Jo. OXON.

July 19.

Honoured Sir,

BEING informed by Mr. *Guiſe*, that upon your recommendation the company has been pleaſed ſo far to own his deſign, as to order his having the liberty to ſurvey ſuch relations and papers of theirs, which may aſſiſt him in his deſign; I am to return my acknowledgments in his behalf, and I am very confident, that neither yourſelf nor the company will have cauſe to regret the encouragement, which you are pleaſed to give him. In my laſt I told you, that Mr. *Guiſe* would not ſatisfy himſelf with putting together printed narratives, and the ſtories of extravagant travellers, but took a journey to *London*, there to receive more particular and ſober inſtructions: but ſuch is his courage and deſire to do his work to all poſſible advantage, that he purpoſes himſelf to go into the *Indies*, and only truſt to his own eyes, and certain knowledge. It is an extraordinary thing, that a gentleman as he is, who is not preſſed by want, and whoſe parts and friends would not fail to prefer him at home, ſhould ſo eſpouſe this affair, as to prefer it before his eaſe and intereſts. Whatever is poſſible to be done by one man, the company may expect from his parts and induſtry. His ſkill in mathematics will enable him to make his own geographical and aſtronomical obſervations; his ſkill in draught and deſigning will qualify him taking the proſpects of cities, havens, and forts, and all remarkable appearances: and his genius towards the acquiring of languages will let him in not only to ſuch a correſpondence with the natives, as may forward his undertaking, but poſſibly advance your Chriſtian and noble deſign of propagating religion, which I pray God ſucceed. You will be pleaſed to continue your patronage, and thereby oblige the publick, and alſo,

Honoured Sir,

your moſt affectionate,

and faithful ſervant,

Jo. OXON.

Letters from Mr. Joſeph Glanvill *to Mr.* Robert Boyle.

Honourable Sir,

I KNOW it is not uſual for ſtrangers of no name or conſideration, thus boldly to addreſs to thoſe of your quality; and perſons of the rank you hold of ſuch great worth and accompliſhments are as uncommon as ſuch addreſſes. But you have diſcloſed ſo many eminent excellencies to the world, that it is impoſſible to know any thing of you without reſpect and wonder; and unjuſt not to pay ſome of the tribute due to ſo great a virtue. You have a nobleneſs, that invites affection, as well, as that which commands diſtance; and I ſhall not diſhonour the ſplendor of your extraction and family by ſaying, that you do more honour your birth, than you are honoured by it; and are leſs illuſtrious by the nobility of your blood, than by that you derive from your proper perfections. Therefore, had I not had an aſſurance of your goodneſs, equal to my apprehenſions of your quality and merit, I had ſuffered my ambition to prefer this little trifle to your eyes, to have languiſhed without the relief of ſo criminal a boldneſs. But, Sir, your native ſweetneſs is my excuſe for this fault, as it was the motive; and you cannot expect to be free from ſuch troubleſom importunities, except you had leſs worth to occaſion them, or leſs goodneſs to encourage ſuch applications. This ſmall diſcourſe, that now begs the favour of your acceptance, can acquaint you with nothing new but the reſpects of the author. Nor hath it any thing

to

to excuſe its aſpiring to ſuch hands, but the devotion, wherewith it is offered you. I am confident your free and enquiring genius is no enemy to pre-exiſtence, or at leaſt to a modeſt propoſal of thoſe Platonick notions. Your mind is too great and generous to boggle at uncommon opinions; and I am ſecure, that you will appoint no other judge of thoſe theories, but an unintereſſed and impartial reaſon. If ſuch as you cheriſh thoſe beams of reſtored Platoniſm, they will ſhine more and more to a perfect day; otherwiſe this light will ſneak back to its forgotten darkneſs, and be buried again in its old obſcurity. I beg no favour for any of my miſtakes or errors; if you uſe them roughly, it is no more than myſelf would do, did I know them. I intreat you therefore to be juſt to the notions, but candid to the management. Upon the credit of thoſe great men, that have owned them, I dare be a little confident of the former; though for the latter I deſpair of any tolerable treatment, but from ingenuity and ſweetneſs. What my motives were to this engagement, I cannot acquaint you without being uncivil to your patience; nor can I detain you any longer by my impertinencies for fear of unmannerly diſtreſſing it: wherefore leaſt my intended civilities ſhould prove rudeneſſes, and my reſpects, injuries, I dare add no more, but the aſſurance, that I am,

SIR,

an eternal honourer of your virtues.

Bath, Oct. 7.

SIR,

I HAVE lately received a letter from Mr. *Jo. How*, the miniſter, in which he tells me, that he acquainted you with a deſign I am now upon, which is to collect ſome modern well atteſted relations of fact, to prove the exiſtence of witches and apparitions; and that you thereupon were pleaſed to mention a notable narrative in your hands of Sir *George Mansfield*'s caſe, which he ſaith you are willing to oblige me with. That will be a very great favour, and I moſt humbly deſire it of you.

I HAVE of a long time been exceedingly importuned to reprint the ſtory of Mr. *Mompeſſon*, which hath been ſo induſtriouſly run down by contrived tales, that have no manner of truth in them, and ſome of them not the leaſt appearance of any. But having not been very willing to intermeddle further in things of this nature, I have till of late contented myſelf to ſatisfy the enquiries, that have been made me about it, either by letter, or word of mouth. But thoſe are now ſo many, and ſo vexatious, that I have at laſt reſolved upon a new edition of my book of witchcraft, and the reinforcement of that certain relation, as well for mine own eaſe, as the ſatisfaction of thoſe, that have ſo earneſtly deſired it. And becauſe ſome books have come out ſince mine, that very confidently oppoſe, and ſcorn the belief of witches and apparitions, and particularly one lately written by Mr. *Webſter*, licenſed by Sir *Jonas Moore*, your vice-preſident of the Royal Society (at which I a little wonder) I have therefore determined not only to confirm what I have writ formerly on this ſubject, but to endeavour fully to prove the main buſineſs by a collection of the beſt modern evidences I can get.

To which purpoſe I have written to divers of my friends to aſſiſt me with ſuch relations, as they have good aſſurance of, and particularly to Mr. *Hunt* of this county, who hath had ſo much to do in thoſe matters, and from whom I had the ſtory of the witch of *Shepton*, printed in my book. He hath been pleaſed to lend me his book of examinations of thoſe witches, with whom he was concerned, and from that I have got ſuch a collection, as I believe will be as good evidence, as any hath ever yet been given in the caſe of witches. Laſt night he was here with me at my houſe (being now in this place judge of the quarter ſeſſions) and told me, that he once related thoſe paſſages to the late moſt worthy biſhop of *Cheſter*, who ſaid, that you deſired an account from him of the ſame, but his occaſions would not permit him ſo much ſtay in town as to wait on you. I hope I ſhall ſhortly give it you as fully, with divers other relations, that may be worth peruſal. I am very careful to inform myſelf of all particulars of thoſe ſtories I uſe, to prevent cavils; and that occaſions many letters and enquiries, which have much retarded my buſineſs: but I make what haſte I ſafely can, and take care not to make too much, knowing what ſevere judges and cenſurers I am to expect. If you ſhall pleaſe, Sir, to afford me the honour and encouragement of your aſſiſtance, by permitting me the narrative Mr. *How* mentioned, it will very much both credit and further my deſign. I hope ſhorty to wait on you at *London*, and am very ſorry I was ſo unhappy as to miſs of you when I was laſt in town. I intended to have ſought other opportunities of paying you that duty, but I was called out of town ſooner than I expected. I do not deſire, that the relation ſhould be ventured by the poſt, or carrier; but if you ſhall pleaſe to order a ſervant to acquaint me with your receipt of this, it will be a ſatisfaction to,

Honourable Sir,

your moſt humble,
moſt obedient, and moſt
faithful honourer and ſervant,

Jos. GLANVILL.

Bath, Jan. 25.

SIR,

WHEN I had laſt the honour of waiting on you, you were pleaſed to promiſe me further aſſiſtance in my deſign, *viz.* the proof of witches and apparitions. I have

got a collection very conſiderable, for plainneſs and ſtrength of evidence, and I hope ſuch as will be enough to ſhame all the atheiſts, ſcepticks, Sadducees, and witch-advocates in the world: but yet a few well atteſted relations may be of uſe for further confirmation; for ſuch I am yet ſoliciting divers friends, and have promiſe of conſiderable aſſiſtance by the duke of *Lauderdale*'s and Sir *George Mackenzy*'s means out of *Scotland*. There is no doubt but *Ireland* will afford as much, which, if you have opportunity, and it be not too troubleſom, I moſt humbly deſire through your means.

I HAVE been often told of late, that you do now diſown the ſtory of the *Devils of Maſcon*, and that a clear impoſture hath been diſcovered in it. The like hath very falſely been reported of Mr. *Mompeſſon* and myſelf, in relation to that ſtory; ſo that I am apt to think, that this alſo concerning you may be a contrived falſhood (for by ſuch ſome men endeavour to run down all things of this kind) and therefore I moſt humbly beg you would pleaſe to let me know, if there be any truth in this ſo confident a report.

I GO hence Wedneſday next towards *Worceſter*, where I ſtay during the whole next month: any letter you ſhall pleaſe to order me, will find me at my houſe in the college there. I am,

Moſt honoured Sir,

your moſt affectionate honourer,

and moſt humble ſervant,

Jos. GLANVILL.

Worceſter, Feb. 24.

SIR,

I MOST humbly thank you for the honour and favour of yours; and am extremely ſatisfied with the account you are pleaſed to give me of your not having diſclaimed the relation of the ſpirit of *Maſcon*: it is confidently ſo reported in divers places; for men will ſay any thing to rid themſelves of the evidence of ſuch things; and therefore I make it my buſineſs to be very careful in the ſtrict examination of all the relations of the kind, that I admit into my collection, and I hope, that which you have already ſent me, and the other Mr. *How* hath for me, will not be diſcredited by their company. I ſhall not ſtay in this place (where I am one of the prebendaries of the church) much above a week longer: when I am ſettled at home, I ſhall write to Mr. *How* for it; and deſire you would accept of my moſt humble thanks for this and your other favours. The great caution I uſe in examining the relations makes my book go on very ſlowly, yet I hope it will be finiſhed this ſpring. I am in expectation of ſome notable ſtories from *Scotland*. Sir, I pray God to keep you in health, and preſerve you long among us, for the inſtruction and benefit of mankind. I am,

SIR,

your moſt obliged, and

moſt humble honourer and ſervant,

Jos. GLANVILL.

Bath, Nov. 2.

Honourable Sir,

THERE is nothing can come from you, but what is very obliging; and your laſt favour I received with the greateſt veneration and acknowledgment. Through the neglect of the carrier it came but juſt now to my hands; ſo that I can ſay no more, but that I implicitly honour it, as I do all the iſſues of your excellent pen, with the higheſt reſpect and affection. I am very ſorry, that I can make you no return ſuitable to this, and the grand obligation of a former favour of this kind; but I ſhall ſtudy to ſhew myſelf acknowledging. And becauſe I find you ſo ready to oblige, I am bold to deſire your acceptance of a ſmall thing of mine, which I have ordered my bookſeller to convey to your hands with this. I have ſomething elſe preparing for the preſs, which is more in the way of your generous deſigns, and will at leaſt ſignify my affection to thoſe noble proſecutions. As ſoon as it is abroad, I ſhall crave leave to preſent it to you, and in the interim beg your candid reception of the aſſurance, that I am,

Honourable Sir,

the moſt affectionate honourer

of your incomparable virtues,

Jos. GLANVILL.

Dr. Wilkins *to Mr.* Robert Boyle.

Wadham-College, Sept. 6, 1653.

Honoured Sir,

YOU have ſo well acted the part, which belongs to me, of returning acknowledgments for the favours recieved at *London*, that I am as much aſhamed, as unable to imitate you. But I have known, Sir, that you are a great maſter of civilities as well as learning, and therefore ſhall in all things moſt willingly ſubmit. I had thought you had gone out of town ſhortly after the time I waited upon you, which was the reaſon I did not attempt to trouble you with a viſit.

THIS bearer is the young man, whom I recommended to you. I am apt to believe, that upon trial you will approve of him. But if it ſhould happen otherwiſe, it is my deſire he may be returned, it being not my aim ſo much

much to prefer him, as to ſerve you, which your own eminent worth will always oblige me unto with my utmoſt zeal and fidelity. If it be not, Sir, prejudicial to your other affairs, I ſhould exceedingly rejoice in your being ſtayed in *England* this winter, and the advantage of your converſation at *Oxford*, where you will be a means to quicken and direct us in our enquiries. And though a perſon ſo well accompliſhed as yourſelf, cannot expect to learn any thing amongſt pedants, yet you will here meet with divers perſons, who will truly love and honour you. And it is the more generous kind of felicity to teach and do good, than to learn and receive it. If I knew with what art to heighten thoſe inclinations, which you intimate of coming to *Oxford*, into full reſolutions, I would improve my utmoſt ſkill to that purpoſe; and ſhall be moſt ready to provide the beſt accommodations for you, that this place will afford. I am,

SIR,

your true honourer, and

moſt faithful ſervant,

Jo. WILKINS.

Mr. John Mallet *to Mr.* Robert Boyle.

Pointington, March 27, 1655.

SIR,

YOUR ſickneſs in *London* ſome months ſince gave me too much ſadneſs, either to be ſilenced on that occaſion, or to be expreſſed with leſs trouble to you, than in thoſe few ſyllables, wherein I ventured to confine my grief, in only telling you, I was in no ſmall meaſure ſenſible of one on that ſcore: and now, Sir, having lately underſtood the much advanced hope of your regaining health, which if it pleaſe God to perfect, by a total remove of all thoſe lingring attendances on ſickneſs, and ſpeedily to redouble your ſtrength, which I moſt zealouſly beſeech him to grant you, my revived joy will be as now my hope of it is already, beyond the expreſſion of a letter: and I longingly wiſh for the happy opportunity of performing my congratulating duties, when I may have the honour of waiting on you at *Stalbridge*, where I underſtand you are ſhortly expected. But, Sir, in the mean time I could not withhold theſe lines, which yet I ſhould have aſſumed the confidence to have ſent you two or three weeks ſooner, had not *Partheniſſa* required ſome of my time to entertain her with moſt ſerious obſervance of her excellent beauties, which are ſo illuſtriouſly delightful, that even the aſhes and funeral flames of that Phœnix obſcure the brighteſt princeſſes and their romances; yet her author muſt be petitioned not to leave her there, but to revive and proſecute her oracle's engagement, as much for the readers, as can be imagined for her ſervant's ſatisfaction; unleſs poſſibly, and very truly too, it may be thought a greater happineſs to have ſuch a monument, as your honourable brother hath given her, than any other fruition could be; and a high recompence of thoſe virtues, for all their perſecutions to be placed in ſo ſerene a ſphere as that admired ſtory, which, were not that way of writing warranted by ſome ſacred preſidents, and by ever being the cleareſt arguments and trials of the moſt able genius's, and the choiceſt favours they beſtow to enlighten the world with, my lord *Broghill* is authority enough to make romances need no other, and to prove, that none can ſo well write of ſuch excellencies as are the myſteries of love, of ſtate, and military glory, but ſuch an excellent perſon, who is as much repleniſhed with the knowledge, as highly renowned for his management of them: and certainly nothing can be ſaid againſt romances, after his owning them, whereby they are rendered as ſafe in his being their ſanctuary, as in their own virtue. And if ever they muſt be excelled by any thing more ſerious or divine, it can only come from the ſame hand, or his noble brother's publiſhing his own ſeraphick treatiſes, which heretofore I have been honoured with the ſight of, as alſo by the many other high favours, which have infinitely rendred me,

SIR,

your moſt obliged,

moſt humble, and

faithful ſervant,

JOHN MALLET.

Dr. Worſley *to Mr.* Robert Boyle.

Dublin, Oct. 14, 1657.

Deareſt Sir,

I HAVE had the honour of two from you ſince my laſt coming into *Ireland*, for both which I have been ſomewhat too long, and too unjuſtly your debtor.

I AM very glad of your ſucceſs in the two experiments you mention about copper and antimony, though the former ſeems to be the more noble, the other being more familiar, if not by the ſame, yet by other menſtrua. But that of copper may perhaps be uſeful, if we can gueſs the ground of that rightly, and can reduce it unto or demonſtrate it from ſome principles of nature. Though I ſhould account it alſo much more uſeful and luciferous, if part of the copper were ſo ſeparated, and the reſt of the body of it were ſome other definite and ſimilar ſubſtance, than if the whole body be made inflammable.

FOR experiments, I have been able to make none ſince I came, but one or two œconomical about drinks; and about a more perfect way of conſerving of green flowers and fruit,

than

than thoſe I did the laſt year, by obſerving ſome error in the former.

FOR the plot, that was laid at the Rheniſh wine-houſe, I look upon it like the ſtory of *Columbus*, who having ſatisfied himſelf, was not diſcouraged in his attempt from the unuſualneſs of the undertaking or difficulty he found in the entertainments of it; but waited with patience until a ſeaſonable time to effect it. And I am told, that this alſo, which you mention was there diſcourſed of, was not taken out of any old manuſcript, or found by chance under an altar-ſtone obſcured by a dark hieroglyphical character, which might be taken in I know not how many ſenſes like the Delphick oracles. But it is in part real experiment; the grounds of it ſolid; the law of it nature; the method of it certainty, or rather neceſſity. That it is not a thing framed in the will of any man, or upheld by the opinion of antiquity; but it is a real door, a key, a light to things viſible, and to the harmony between them and other things inviſible. But the times, ſeaſons, and opportunities for all things are in the hand and diſpoſe only of the Lord.

YOU are pleaſed to mention a book lately come forth, endeavouring the reconciliation of the Dogmatiſt with the Helmontian, which I would be glad to receive your opinion further of.

I AM much affected with the generality of your late contagious feveriſh diſtemper, but am able to offer little that is peculiar, having made no obſervations peculiarly of it. The beſt general remedy I have yet had an opinion of is your Radix Virginiana, which as it is an effectual and potent alexipharmacon againſt the virulent poiſon of the rattle ſnake or adder, ſo it is looked upon by ſome as one of the beſt ſimples of many to reſiſt all contagious putrefaction. I think it however a ſafer and more innocent medicine than many other.

IF you thought that large letter worth the communication to our learned friend with you there at *Oxford*, I would be glad to receive ſomething, that might offer a further occaſion for diſcuſſion and debate, being no way tied to this or that opinion or expreſſion. I am,

Dear Sir,

your hearty affectionate ſervant,

B. WORSELEY.

Dr. Pope *to Mr.* Robert Boyle.

Paris, Sept. 10, 1659.

Honoured Sir,

I HAVE been long balancing with myſelf, whether it were more pardonable in me, to omit writing, or to write nothing to you. In the one I ſhould forget myſelf and my obligations; in the other the reſpect, that is due to you, who, I preſume, are not uſed to receive empty letters. The receipt of that letter you were pleaſed to honour me with, put it paſt queſtion, that I ought to trouble you with an anſwer. Though I am very much aſhamed to tell you, that I have ſpent moſt of my leiſure time in reading romances, which we hire like horſes, and monſieur *Corneille*'s plays, and in viſiting the eminent places in and about this city. And that as yet for want of language, or boldneſs, or recommendation, I am not acquainted with any whom you enquire after, except monſieur *Petit*, who pretends to know very much in glaſſes, and mechanicks; and, if you will believe him, there is neither prince nor prelate in *France* minds any thing, that is curious, beſides himſelf. Sir, here is publickly ſhewed in *Paris* a kind of a wooden ſtone, found betwixt this and *Rouen* by an odd accident. A fiſherman took it up, and tied it to his boat, thinking to ſtop his boat with it, which it did not do, but followed the boat, ſwimming upon the top of the water. It weighs 54lb. it is very hard, though full of little holes, as thoſe ſtones are, with which they make grotto's. It is of an irregular figure, ſomething above a foot long, near half as broad, and about a third in thickneſs. It ſwims without fraud, and thruſt down a hundred times to the bottom mounts as often. Sir, I humbly deſire your pardon for filling this letter with ſuch trivial intelligence; if any thing better come to my knowledge, you ſhall be informed of it by,

SIR,

your moſt humble,

and obliged ſervant,

WALT. POPE.

Mr. Codrington *to Mr.* Robert Boyle.

October 2, 1660.

SIR,

BEFORE I ſuffer this pen to paſs any further, I muſt return you my moſt humble thanks for the gratuity, which about ten years ſince I received for the book, which I then dedicated to you. What here incloſed I have now preferred to your obſervance, I muſt beſeech you to grace with your acceptance. It is a poem in Latin on a grateful ſubject; I have taken ſome pains in the compoſure of it, and have been induced by ſome worthy friends, who truly honour you, to devote this ſervice unto you, unto whom all learning oweth for a patron, and the world for an example. I doubt not but you have ſeen many books extant under this hand in proſe. I am now printing all my poems, a great part whereof I have dedicated to many eminent perſonages amongſt our nobility, and gentry, and to ſome doctors, as famous for their learning and their piety beyond the ſeas,

as in our own univerſities. I muſt beſeech you with the ſame candor, that you will be pleaſed to accept of this, which moſt preciſely doth devote itſelf to you, and is proud to wear the honour of your name on the forehead of it: may it return me any teſtimony of worth from your accurate judgment; the many laurels, which the world hath given me, ſhall not ſo much crown me, as the honour I ſhall receive to have pleaſed you, and to expreſs my ſelf,

SIR,

your moſt humble

and devoted ſervant,

ROBERT CODRINGTON.

SIR, I have lately rendred into Engliſh a book of my lord biſhop of *Lincoln*'s, intituled, the Obligation of Conſcience; it is in the original dedicated to you. I was, indeed, offered to dedicate the tranſlation to whom I pleaſed, but I have followed the doctor's example, and it continues in the tranſlation ſtill unto you, and in the doctor's own words, as may appear by the book, which is now newly extant, and to be ſold by Mr. *James Alleſtry*, at the ſign of the Bell in *Paul*'s church-yard; I thought fit in this place to acquaint you with it, becauſe I do find it to be well pleaſing to the doctor, who (I thank him) prefers the tranſlation; and I hope it will prove as acceptable to you, for I am aſſured it had been impoſſible for me to give it to a more noble or a more lettered perſonage.

Mr. Thomas Povey *to Mr.* Robert Boyle.

Lincoln's-Inn-Fields, May 8, 1661.

SIR,

I CONSIDER my ſelf to be very unhappy, that I was not at home to receive you, as well as your book; for, although I eſteem your eſſays according to the value, which is given them by ſuch as are beſt able to judge; yet you being in your ſelf a full and noble library, and my way of reading, and my improvements (if I have been capable of any) being by converſation, and by the living diſcourſes of ſuch as are worthy to be ſtudied; I have reaſon to prefer what I loſt by my abſence to what I found, when at my return your excellent volume was delivered to me by my ſervant; which nevertheleſs I thank you for, as for a thing rare and precious, although not ſo deſirable, or ſo beneficial to me and to mankind, as your own ſociety and example; by which it is more eaſy and more delightful to advance towards learning and virtue; the qualifications by which you are as eminently known to the world as by your name. Much of this I had ſaid to you, if I had found you, where I intend to leave this in your abſence; with which you will receive a ſmall quantity of pepper of *Jamaica*. I can only ſay of it, that it exceedingly ſatisfies my ſmell and taſte; and ſeems a proper ſeaſoning to any that affect cloves, nutmegs or mace; the aromatick richneſs of all which ſpices being plainly imparted by this generous berry. I could wiſh you would throughly examine it, by making ſuch experiments, that the qualities of it may be well diſcovered and underſtood; for I am ready to believe, that it is not of a low or ordinary degree. I have prayed Sir *Robert Moray*, that he alſo will attempt ſomething upon it. And, if you ſhall hold it worthy of your favour and approbation, I ſhall ſerve you with a greater quantity. I am,

SIR,

your moſt humble ſervant,

THO. POVEY.

Dr. Boyle *biſhop of* Corke *to Mr.* Robert Boyle.

Dublin, Aug. 13, 1662.

Honoured Sir,

I RECEIVED the honour of two of your letters ſince I left *England*, and both upon the ſame account. I had long ſince made you my acknowledgments for that noble favour attended with ſome return to the particulars of thoſe letters, had not my deſires to acquaint the earl of *Orrery* with them (who being then in *Dublin*, and I in the country) occaſioned my delay all this time; for which I humbly beg your pardon. As to the buſineſs itſelf, I am perfectly ſatisfied, that your deſign (if you had any, for I cannot yet imagine you to be any otherwiſe than paſſive in the whole matter) in acquiring thoſe impropriations was charitable and religious; for you cannot do any thing that is otherwiſe. I muſt likewiſe very much applaud your pious intendments for the advancement of real learning, and eſpecially for the extenſiveneſs of your charity towards the poor Heathen natives in *New-England*: but yet I muſt humbly take leave to acknowledge myſelf unſatisfied, why that additional revenue, which his majeſty deſigned and promiſed for the better ſupport of the clergy here, that they may with greater comfort attend the cures of their ſeveral churches, ſhould be diverted to any other uſe, though in itſelf it be generous and handſom; eſpecially when I conſider, how many congregations depend upon the ſervice of thoſe pariſhes; how deſtitute they will be of a church to reſort unto; how the poor people will be compelled to wander through the country to find out an opportune place for the performance of their publick duties and devotions unto God; for although at preſent your piety provides all that poſſibly you may, to prevent theſe ſad conſequences, yet you know not how they ſhall be minded, who ſucceed you; nor are you certain, that thoſe other perſons (whoever they be) that have obtained this grant under your patronage, will be as inclinable

upon that account as you are. If they be not, (as it is great odds on your ſide againſt moſt men living) it will not then be unworthy your conſideration, whether ſomething of their fault will not be chargeable upon you, by whoſe only means they were inabled to do the prejudice.

As to that advice and reſolve, which was given you by that moſt excellent prelate (whoſe piety and learning makes him deſervedly honoured by all, that have either known or read him) I muſt neceſſarily believe it was founded on a very great miſtake; for in caſe the difference be otherwiſe than it is ſtated in your letter, if that bleſſed martyr *Charles* the firſt did in his life time ſolemnly devote all impropriations unto the church, that ſhould be any way inveſted in him; if his moſt gracious majeſty, that now is, ſhould as an early evidence of his gratitude to God for his miraculous reſtoration, immediately after his acceſs into his kingdom, engage himſelf in the like bounty to this church of *Ireland*; if his majeſty had not only promiſed, but actually granted them under his privy ſignet, before any conceſſion (of what your grant contains) was made unto you (whereof each particular may, as I ſuppoſe, be made ſomewhat conſpicuous) then certainly you will think it worthy ſome farther conſideration, whether you will inſiſt upon that grant, or no.

DEAR Sir, I humbly beg your pardon for this freedom, having no other obligation thereunto, but my faithfulneſs to the truth and to your ſelf. I am now freed from that publick truſt, which was incumbent on me, while I was in *England*, and have not the leaſt pretence to any of thoſe particulars included in your proviſo, which, I preſume, will ſecure me from any miſinterpretation of being leſs than I am obliged to be, or leſs than I profeſs to be,

Dear Sir,

your moſt faithful

and moſt affectionate

humble ſervant,

MICH. CORKE.

Dr. Collins *to Mr.* Robert Boyle.

Colmogoro, 60 werſts from *Archangel*, Sept. 1. 1663.

SIR,

THE noble preſent of your learned book has extremely obliged me. Indeed the defects and difficulties, which I have found in our profeſſion, have ſo much diſheartened me, that I had quite deſerted that deſign, if my narrow eſtate had not neceſſitated me to make uſe of that art to an honeſt ſubſiſtence. Not to inſtance in the grand reproaches of the gout and quartans, and ſome other horrid monſters; I could never find any author, that gives an account of ſome ſorts of ſtinking breaths, nor of the cure. The rectifying of that one diſtemper ſurely were enough to make a man richly famous. Another is, the cure of red faces, in which I have known methodiſts travail a long time, without ſucceſs. To be quit of either, I know ſome perſons would part with the better half of their eſtates. We grope alſo in the cure of *Lues Venerea*, both in that tedious mild way of decoctions, *&c.* and that other ſlovenly, uncertain, dangerous way of ſalivation. I have had ſeveral times unexpected ſucceſs in ten or twelve days by that ſlight preparation of mercurius cum ſulphure. And for giving eaſe to thoſe ſharp nocturnal pains, I have uſed only an infuſion of mercury nitre (in ſpirit of wine) well made almoſt your way, by drying it and a proportion of tinctura opii exhibited at night going to bed, which hath gently ſweated the patient, and in two nights taken away thoſe torments; and finding it ſucceed ſo well, I proceeded to fifteen or twenty nights ſucceſſively, to which I aſcribe moſt of the cure. As to the cure of quartans, methodiſts and others uſe vomits, diaphoreticks, and an ecphractick courſe, chalybiate *&c.* fruſtra, when it is eaſily effected by reſtringents, as tormentile with gentian in electuaries, decoctions, which ſtrengthen the relaxed parts, and given before the fit, with a grain of well prepared mercurius nitre; it vomits not, but is as valid as the pulvis patrum, which I can affirm experimentally. But not to trouble the ſun with a candle, I ſhall only beg your aſſiſtance at your beſt leiſure, *de cauſis & cura fœtoris oris*; I mean not that, which is ſo manifeſt, as in ulcers of the lungs, or crudities, but in one, that ſeems to be every way ſound, *&c.* A nobleman very near the emperor has a red face, who is often upbraided with drunkenneſs, and none will believe but he drinks in private (for publickly he does not) has confeſſed to me, he hath been, and ſtill is, the moſt abſtemious perſon in the world, and has run a courſe with the German doctor now in *Moſcow* for ſix weeks; and after much blood-letting and purging hath been a little paled, but *naturam expellas furca licet &c.* Now to come to what concerns your commands; in theſe cold parts, I can only promiſe my beſt endeavours, when the froſt comes. I fear, I ſhall not have the conveniencies, that I would have, if I am confined to the embaſſador's quarters, which I ſhall be, till I conclude, whether I will engage to ſerve his majeſty, or not; in which I ſhall uſe ſome demur, till I ſee, whether there will be a good concluſion in our embaſſy about the reſtoration of the privileges, and what hopes of peace in theſe parts; for as yet they are embroiled with Pole, Tartar, and Swede.

You may pleaſe to remember, we were at *Lees* talking of their witchcraft, in which the Ruſſe are very ſtudious (eſpecially the nuns) whether imaginary or real, I know not, only what men have confeſſed to me has been acted upon themſelves in viſible wens and bladders ſet upon ſome, on their foreheads; on others ſopra'l cazzo, others diſabled for months and years, and then reſtored, as one of my friends a Ruſs does now acknowledge at

Archangel, I ſay, to thoſe I am bound in civility to give credit; nay, they will ſo diſable a woman, as her huſband for ſome time ſhall find her uncapable. They are nevertheleſs too credulous as to the buſineſs of witchcraft, that they aſcribe all unuſual accidents to faſcination; and if they have any about them, that they ſuſpect (eſpecially old women, who are moſt obnoxious) they torment them worſe than *Hopkins* the witch-finder in *Eſſex*, till they extort their queries out of the old wretches, to their utter ruin. An inſtance of which I have newly received from *Moſcow*, where the empreſs's father * lately married to a ſecond wife, not finding himſelf ſo vigorous in his amorous engagements as formerly, or rather as he deſired (forgetting, that now he is not far from ſeventy) he conceived, that a former miſtreſs his menial ſlave (who was ſhadowed by a huſband, to prevent inconveniencies) I ſay, he ſuſpected ſhe might in reaſon malign his lady, that came to eclipſe her happineſs, and ſo had contrived this ſuſpected faſcination, which was attended alſo with ſome diſtempers broken out in his legs, nocturnal laſſitudes, and his lady ſurpriſed with an angina, all which conſpired to rivet their jealouſies on both ſides, ſo that ſhe ſuſtained all the exquiſite torments of *Ruſſia*, in which alſo her huſband was concerned, and all the old wives thereabouts, that had any deformity, or diſpoſed to look ſourly or melancholick. I fear at my arrival in *Moſcow* I ſhall be tormented with the relation, as much as they with the whip, and my opinion muſt be aſked, which will not give ſatisfaction, if not compliant with their vain fantaſies.

* *Elias Danelourdge.*

SINCE I began writing I heard from *Moſcow*, that a Tartar, a friend of mine, hath procured me out of *Siberia* the ſkin of that beaſt, which affords us the muſk out of *Siberia*; the muſk is the navel, as they ſay, but when I have it, I will give you a true account, and the rarity itſelf. If your leiſure permit to write the latter end of December, or beginning of January, pray give your letter to Mr. *Butterſby* at the great Helmet in *Fenchurch-ſtreet*, who does provide our medicaments for us, and is a very honeſt man and able apothecary. My humble ſalutes to my lady *Warwick*, lord *Rich*'s lady, with my humble petition to your ſelf for this trouble I give you in the reading ſo much ill writing. *Adio e viva vita d'oro.*

Your humble ſervant,

SAMUEL COLLINS.

SIR, I beg your pardon once more for this trouble, which may very much tend to my advancement, if you can aſſiſt me in the whitening of copper, that may abide the fire and hammer: it is no matter, whether it will the water of ſeparation; for I was deſired by a great favourite here to procure ſuch a ſlight, to get a fictitious counterfeit plate made, which no doubt would be gainful in theſe parts, or any other; not to deſign a cheat, but certainly it might be a great ſaving of ſilver, which lies dead in noblemens houſes. I went thus far by purifying the copper with powder of glaſs, that it became ponderous and fine, like ſilver; for the glaſs ſerved to waſh her ladyſhip's foul ſmock, which was taken off as oft as it became black with its fuſion together; now when we came to the blanching, either we knew not the proportion of arſenic, or the preparation, for it was either white enough and brittle, or yellowiſh and not brittle. I deſire your advice about fixing of arſenic a ready cheap way. One *Smart*, that dwells in *Dorcheſter-houſe*, a drudging operator, made me pay ten pence for an ounce, but it was well fixed, and may be given inwardly, in a doſe of three, four, or five grains, and decocted loſes no weight, but imparts a balſamick virtue. Now I talk of balſams, methinks ſome better uſe might be made of the film or huſk, that covers the ſhell of piſtachios: it hath an excellent balſamical odor, and is clammy, and a handful being cloſe griped, leaves many reſplendent cryſtal parcels in plicis palmæ; this I made trial upon the way, they were very new. I intend to try it for a vulnerary. There are ſome things uſed by the Ruſſes experimentally, which I ſhall impart; they come out of *Siberia*; by which way they bring radix Chinæ teuh, or chayè aniſum Indicum ſtellatum, which the Perſians here drink with their teuh, and is ſcented juſt like our aniſum, but methinks more grateful and very oleaginous. Here is a certain wooden ware, which the Ruſſe call capua, the Dutch Mazer, the gummy droppings from birch, which, as they ſay, lies many years conſolidating in the ground, of which they make cups, very thin, light, and almoſt tranſparent; being put into warm water will turn inſide out, like leather, and are ſold the weight of ſilver for wood, and according to their largeneſs, the larger the dearer, twice, thrice, or more the weight of ſilver. I bought three at *Archangel*, with intent to ſend them to you, but I find by one ſkilful in that trade, that I was deceived, and they were counterfeits, with the feet cunningly ſet on and glewed, and patched up in ſeveral places with varniſh; ſo I was diſcouraged from ſending them, but ſhall procure ſome at a place called *Totmá*, on the river above *Uſtiga*, where they have mineral ſalt waters. Sir, if I ſtay here, pray aſſiſt me with ſome rarities in our art. I ſhall be remote enough to do no man injury by the uſe of them. What I ſhall find worthy of a perſon of your learning and experience, I ſhall contribute, as an humble acknowledgment of your civilities.

I HAVE forgotten to mind your opinion about the Iriſh ſlate, which abounding with ſo much ſalt, I ſuppoſe may ſerve to many uſes in phyſick, beſides the vulgar, *viz.* contuſions, which how it poiſons, I know not; but it is much uſed for that purpoſe in the Weſt of *England*; and I have given it with ecphracticks, and I think it hath done well.

WHEREAS you hint in your book about a farther enquiry and uſe of the pulvis patrum, I did, upon my own fantaſy, give a doſe of it

to *Knez Peter Broſoroſſky*, the Ruſſe embaſſador, when he was very ſick of a very violent fever, and thought in himſelf he ſhould die; it gave him ſudden relief the third day, and we expected no other criſis; I ſuppoſe it may do good in the gout, ſtrengthening the parts, and ſtopping the fermentation.

IF I had time, I would give you an account of their dreſſing their hides here; the odd ſmell, which Ruſſia leather has, it takes from the deogat, which is a kind of tar made of the roots of birch, and ſerves for many uſes, *&c.*

THAT operator *Smart* at *Dorcheſter-houſe* ſold me a ſtinking ſulphurous balſam, that I have uſed with miraculous ſucceſs in ſore eyes. I forget what he calls it; Mr. *Butterſby* can help you to it. He makes ſulphur martis. If you know the making of ſulphur martis, pray impart it.

Vologda, Nov. 20, 1663.

Honourable Sir,

I CANNOT get a larger room than this in my lord embaſſador's packet, which may beſpeak my endeavours. The winter has hitherto been ſo mild, that I have not yet given myſelf any ſatisfaction concerning thoſe experiments of cold. I do not well underſtand the way of ſome things in your note of enquiry, being but hinted in ſhort; however I ſhall do my beſt to obſerve as much variety as I can of freezing, and the divers effects of cold, which may be done here (where we are) better than in *Moſcow*, being more northward. We are frighted with the alarms of the Poles, Coſſacks, and Tartars, who are ſaid to be between *Smolenſko* and *Waſma*, twice ninety werſts from *Moſcow*, all which hath happened by the confidence of the Ruſſe of a ceſſation, being tired with a long tedious war, and willing to diſband their army, to ſave charges, had no ſtanding army to reſiſt the invaſion of a great army of horſe under general *Sapega* and general *Pattz*; the king in the mean time with a royal army attending the motion of the imperial forces about *Bealogorod*. What the iſſue will be, God knows, for certainly the Ruſſe have been cruel to the borders, while they were conquerors, and divers fatal ſigns have forwarned the Ruſſe to make an honourable peace, when they might have done it in the time of the wars between the Pole and Swede, *ſed quos Deus vult perdere, &c.* To omit many, which I have formerly noted in my Adverſaria, with a ſhort account of theſe parts, which I ſhould offer to your view, if I thought it worthy; there was laſt December, about the beginning, a dreadful blazing ſtar ſeen here by many, and at the ſame time an earthquake (hardly ever known in theſe parts) with which ſome people were caſt down to the earth, and one woman ſtricken blind, deaf and dumb for ſome days, and recovering her ſenſes and ſpeech, foretold a viſion, which the hearers ſtopped their ears at, or tongues, at leaſt, as being of too dangerous conſequence to be revealed. All which things amaze the graver ſort of people, and want only the event to make them either authentick or fabulous. I forgot to tell you what was obſerved concerning the general *Knez Jocov' Coodanickowich Chircaſkoy*, who twenty days ſince marching forth to ſtop the enemy's incurſion, the *Moſcow* bridge broke under the cannon; and attempting another bridge, that broke alſo. It is very like the timbers were diſproportionate to the weight of the cannon. *Sed Deus det pacem in diebus noſtris.*

I EXPECT ſome letters from a friend in *Siberia*, to whom I wrote two years ſince, deſiring an account of the animal, that yields the muſk, and a ſkin of that beaſt; which, and what rarities elſe I obtain, ſhall ſend or bring to you. My ſervice to lord and lady *Warwick* and your ſelf, and lady *Anne Berkley*. *Adio e viva vita d'oro.*

Your moſt humble ſervant,
S. COLLINS.

Mr. Cooke *to Mr.* Robert Boyle.

Aug. 13, 1664.

SIR,

I AM unknown to your honour, but not unknowing of your excellencies and the renown you have juſtly thereby gained amongſt all the literati and ingenious. I know your parts and endowments are far above the talent of other perſons, and yet no leſs inferior to your charity: the firſt gets you the admiration of the intelligent, and the latter the importunity of the indigent. I confeſs, I would willingly aſpire to the nobler qualification, but having greater need to be a beggar, than pretence to be an admirer, I make bold to implore your favour on the behalf of a poor child of mine, whom I vehemently ſuſpect of the infirmity we call the king's evil. I have, Sir, in reading your incomparable books met with the mention of a nameleſs, and (as you are pleaſed to ſay) deſpicable herb, endued with a ſpecifick quality for the cure of that diſeaſe. The diſcovery of that ſimple I preſume not to aſk, though ſecrecy be part of my profeſſion, and I ſhould in this caſe readily confirm it with the double bond of oath and honour; but help for my child being the end of my deſires in this particular, I only beg the uſe of that herb diſguiſed or preſented as you ſhall think fit and direct: and however it may continue a ſecret to me, yet I ſhall not forbear to publiſh the fame of my benefactor to all the world; and amongſt other high advantages, which I may receive, reckon this for none of the leaſt, that this addreſs gives me the honour and opportunity of profeſſing myſelf,

SIR,
your honour's moſt humble,
and moſt obedient ſervant,
Jo. COOKE.

YOUR

YOUR honour's commands will find me at Mr. ſecretary *Morice*'s office in *Whitehall.*

Mr. Endicott *to Mr.* Robert Boyle.

From *Boſton* in *New England*, Nov. 9, 1665.

Honourable Sir,

THE occaſion of our giving you the trouble, is from the confidence we have of your favour and care of theſe his majeſty's colonies in *New England*, manifeſted by your continual endeavours, as in promoting that good work of the native's converſion, ſo in taking opportunities for ingratiating us with his majeſty and the right honourable the lord chancellor, as we underſtand by your letter to Mr. *Winthrop*, whereby you have given us that comfortable information of his majeſty's grace towards us, expreſſing himſelf in a very favourable manner; and that the lord chancellor did aſſure you (with giving you commiſſion to aſſure our friends in the city) that the king intends not any injury to our charter, or the diſſolution of our civil government, or the infringement of our liberty of conſcience; and that the doing of thoſe things is none of the buſineſs of the commiſſioners; the truth of which we believe as we ought, having the word of ſo gracious a king.

BUT alas, Sir, the commiſſion impowering thoſe commiſſioners to hear and determine all caſes, whether military, criminal, or civil, what they have further by inſtruction at preſent we know not; ſhould this take place, what would become of our civil government, which hath been under God the hedge to that liberty for our conſciences; for which the firſt adventurers paſſed through and bore up againſt all difficulties and diſcouragements, that encountered them, as in the way to, ſo in their continuance in this wilderneſs?

SIR, we return unto you our true and hearty thanks for your former favours, and crave the continuance thereof as opportunity ſhall offer; and the great mover of hearts ſhall incline you in appearing our friend ſtill, that, if poſſible, the commiſſion may be recalled, for which end we have made our humble ſupplication to his majeſty, in whoſe eyes may we find favour, we and our poſterity ſhall have cauſe to bleſs the Lord; but if the decree be paſt, ſo that it may not be recalled, we ſhall wait the Lord's iſſue with us; and whatever may be the conjectures of any rendring alterations here adviſable, the iſſue will ſpeak them to be the ſubverſion of all that, which makes this place or our abode therein deſirable, or if the envy of thoſe, that deſire a dominion over us (not to ſerve his majeſty's intereſt in advancing plantation work with the continuance of godlineſs, but to ſerve themſelves by his majeſty's authority and our ruin) ſhall prevail, it will to poſterity be rendered a diſſervice to his majeſty's honour, and ſuch a damage, as the procurers will not be able to repair. We can ſooner leave our place, and all our pleaſant outward enjoyments, than leave that, which was the firſt ground of wandering from our native country; nor are we thereby made ſuch ſtrangers thereto, but we can rather chooſe to return, and take our lot with our brethren, than abide here under the deprivement of the end of our travels; our way is with the Lord. Craving your honour's pardon for this boldneſs, lifting up our beſt deſires to the Lord for you, we remain,

SIR,

Your humble ſervant,

JO. ENDECOTT, governor, in the name and with the conſent of the general court.

Mr. Nath. Foxcroft *to Mr.* Ro. Boyle.

From my father's at *Finſbury Court-houſe*, over-againſt the *New-Artillery* near *Moorfields*, Nov. 29, 1664.

Moſt honoured Sir,

PURSUANT to your commands, and in compliance with my own ambitions to ſerve (though this inſtance be but a very ſmall hint of my promiſed future endeavours) ſo obliging and excellent a perſon as yourſelf, I have ventured the preſumption of this, whereby to let you underſtand the ſucceſs of an enquiry you were pleaſed to engage me to concerning a carbuncle; ſo ſtiled by an acquaintance of mine, in whoſe hands it was depoſited, untill the determination of a ſuit at law about it; though his deſcription, I believe, will incline you rather to conclude it a diamond, being of the ſame colour, or water therewith, of a tablet cut, and better than half an inch ſquare. That part of the relation I made of it to you was true, that it being laid on the ground in a dark night (without the circumſtances of rubbing, which you have obſerved neceſſary to ſome) would appear very luſtrous at the diſtance of about threeſcore paces, not imputable to the reflection of ſome lights or ſtars ſhining thereon; ſince it would do the ſame alſo in a dark room, where ſuch cauſes were not admitted. I made a diligent ſearch after it, that, if poſſible, I might have given you the entertainment to have viewed it yourſelf; but found its worth was ſo extraordinary, that it exceeded the purchaſe of a private purſe: wherefore it was tranſported, and at laſt ſold to the Infanta of *Spain*, in whoſe poſſeſſion it now remains.

THERE is another part of your injunctions, which I hope will prove an argument to plead my pardon for this boldneſs, which you will readily remember, when you ſhall underſtand, that within theſe ten days I am deſigned for Fort *St. George* in the *Eaſt-Indies*; not a little glad of the occaſion, if in any thing I may

may be inſtructed to be tributary to learning, in being ſerviceable to ſo great a maſter thereof as you, whoſe directions I ſhall with much obſequious diligence make it my buſineſs to obſerve; and where my unaccompliſhments render me defective, I beg you to impute it to my incapacities, and not want of will or affection to be otherwiſe.

AND, Sir, though I muſt confeſs myſelf a very bad and unconfident beggar, yet (encouraged by your offer, and my own hopes to make ſome not unacceptable eſſays therewith) I now preſume to requeſt the favour of ſome fluxing powders, with directions from firſt to laſt how to uſe them. My non-experience deſires you will be a little particular on a ground-work, whereon my deſigns flatter me with a promiſe of no contemptible ſuperſtructures or ungrateful conſequences. The command of any, which attainment (if meriting your diverſions) I will promiſe ſhall never be out of your reach, ſince it was you firſt fired me unto ſuch attempts. And as a farther endearment of this favour, be pleaſed to add, by what ſigns you would diſtinguiſh thoſe earths, which encourage to ſuch experiments, and are moſt probable to afford ſuch metals, as may not be unworthy the like ſearches: for, if I miſtake not, you only hint in ſome of your writings to have found in certain earths (not particularly deſcribing any) no inconſiderable quantities of gold, and go no farther.

BUT I fear I have tranſgreſſed too much againſt what a ſtranger modeſtly ought to allow him in his firſt deſires, which ſhould be ſparing: if mine exceed thoſe limits, I requeſt you to believe them not occaſioned by the impudence of the beggar, but rather from the conſideration of the largeneſs and bounty of your mind, which has every where given abundant teſtimonies of your contentments to oblige all ingenuous to an inquiſitiveneſs into nature's myſteries, which is my deſign. In the proſecution of which if I ever attain unto any thing worthy, I muſt acknowledge the reading of you begot thoſe aſpirings; whilſt I confeſs myſelf therefore ever obliged

Your in all humble returns
of thanks and ſervice,
NATH. FOXCROFT.

MY mother returns her gratitude in all humble acknowledgments of thanks for the medicine you preſented her at *Oxon*; and deſires you will ſignify, whether it was ſpirit of hart's-horn or not, as likewiſe when you deſign to be in *London*.

Mr. Ra. Auſten *to Mr.* Robert Boyle.

Oxon, Jan. 14, 1664.

Honoured Sir,

I SHALL at this time make bold to acquaint you with my purpoſe, in reference to a buſineſs of ſome concernment, much deſiring your favour, counſel, and directions therein: and where you perceive I have preſumed too much with you, that therein I may receive a friendly rebuke, together with your pardon. I was lately diſcourſing with a ſtationer (newly ſet up here in *Oxford*) who diſcovered to me his deſire to have another impreſſion of my treatiſe of fruit trees; for that this ſecond impreſſion is even ſold off. I told him, that I would conſider of it, and give him a further anſwer. The truth is, I have ſeveral additions to make unto it, intending (God willing) to communicate them in due time: it may be, it is now not unſeaſonable.

AND in order thereunto I have made bold to compoſe a brief epiſtle dedicatory unto your worthy ſelf, humbly craving your leave ſo to do: a copy whereof I thought it meet to incloſe herein, that you might ſee my deſign, and that I might obtain your advice upon the whole matter. I now intend only the firſt part, that is, the natural part, about the propagation and ordering of divers kinds of foreſt trees, with fruit trees, and fruit.

As for the ſpiritual part (the ſimilitudes between natural and ſpiritual fruit trees) I conceive it beſt upon ſome accounts, to let it reſt (at preſent) both what hath been made publick formerly, and what I have prepared to add thereunto: and (worthy Sir) by your countenancing of the work, it will be more profitable to myſelf, and more acceptable to others. Your name and worthineſs is had in high eſteem among men, who know you, or have heard of you; God having (viſibly) ſtamped his image upon you, in knowledge, wiſdom, and holineſs; it commands reverence and reſpect, where it appears, eſpecially when we conſider, what the apoſtle ſaith, that not many wiſe men after the fleſh, not many noble are called. Thoſe therefore among them, that are called, are as precious jewels and pearls among pebbles; or as the lily among thorns; ſuch being doubly noble, not only by a natural birth, but alſo (and infinitely more) by a ſpiritual birth; a birth from above, born of God, without which a man had better never to have been born.

SIR, theſe things I ſpeak in ſincerity and truth.

I SHALL not further trouble you at preſent, more than to deſire (at your next opportunity) a few words of counſel, and advice from you (much honoured Sir) unto

Your unworthy ſervant,
RA. AUSTEN.

The biſhop of Limerick *to Mr.* R. Boyle.

Farnham-Caſtle, Dec. 3, 1665.

Honoured and dear Sir,

THOUGH I cannot give you a church preferment, I do give you a church employment. For I dare venture on your goedneſs,

goodneſs, and flatter myſelf, that you will not be diſpleaſed for my ſo doing.

THIS act, which you receive with this letter, I ſhewed to my lord chancellor at *Saliſbury*, for his approbation; but he liked it not as to the form and drawing up: yet withal adviſed me, that it ſhould not be preſented to the council, until the form thereof were altered, in a new bill from *Dublin*. And that the archbiſhop of *Dublin* might know how it might be amended; his lordſhip was pleaſed to ſay, that he would give by the next poſt the reaſons of his diſlike to my lord lieutenant, which reaſons are not yet come to his grace.

THE favour I beg of you is this, that after my humbleſt ſervice is preſented to my good lord chancellor, you will deſire of his lordſhip to impart to you the faults of that bill, that it may be amended in the next.

I GIVE you, Sir, this trouble, the rather becauſe I know you have a fair reception from his lordſhip, and will therefore obtain this favour the eaſier.

WHAT anſwer you receive from his lordſhip, if you pleaſe to ſend to Mr. *Wyat*, vice-principal of St. *Mary-hall*, you will further oblige,

Your moſt affectionate,

and real ſervant,

GUIL. LIMERIC.

MY lord of *Wincheſter* remembers him very kindly to you.

Dr. Edm. King *to Mr.* Robert Boyle.

London, from *Boſwell Court*, Nov. 25, 1667.

Honoured Sir,

PERHAPS at firſt ſight you will wonder at my confidence in preſuming to preſent you with a letter; but if you pleaſe to conſider my great obligations to love and honour you, I hope I need make no apology for it, unleſs for want of language to expreſs your worth, and my deep ſenſe of it: for in earneſt, Sir, I find by experience, that great thoughts are of difficult birth, and I do bluſh at the defects of my expreſſive faculty; yet I will encourage myſelf with this, that the account of the following experiments will (for this time) purchaſe my pardon for giving you the trouble of it. Dr. *Lower* procured a man about thirty two years of age, willing to receive ſome ſheep's blood (they call him Dr. *Cogie*, he ſpeaks Latin well, when he is in that company he likes) his brain is ſometimes a little too warm. On Saturday morning laſt at eleven at *Arundel* houſe we met, and having prepared the carotid of ſheep, I opened a vein in the doctor's arm at once, as expreſſed in the laſt Tranſactions but one; and uſed juſt that method, without any alteration (only one pipe more convenient) after we had taken away about ℥vii. of the doctor's blood, we infuſed (as near as we could gueſs) about x. or ℥xi. of the ſheep's blood, with very little trouble to him, three quills length beſide the pipe; yet when we took it out, after near two minutes, it ran as freſh as at firſt, which was an infallible ſign; it did not ſtop, but beſides we felt a pulſe in the arm; when we had done, we bound up the arm as after bloodletting, and he well and merry, and drank a glaſs or two of Canary, and took a pipe of tobacco in the preſence of forty or more perſons; ſo went home, and continued well all day, having three or four ſtools as he did uſe to have; his pulſe ſtronger and fuller than before; and he very ſober and quiet, more than before, as the people in the houſe tell us that think he was only let blood; in the night he ſlept well, but ſweat two or three hours, and next day was very well, and ſo remains, and is very willing to have it repeated (we gave him a guinea for his willingneſs) for his arm, he ſays, is well. This is a general account of it; I did intend to be more particular, but am forced to break off abruptly, for which I moſt humbly intreat your pardon, which will farther oblige,

Honoured Sir,

your moſt obedient, faithful,

and affectionate ſervant,

EDM. KING.

ONE aſked him, why he had not ſome other creature's blood, he told them, that *ſanguis ovis ſymbolicam quamdam facultatem habet cum ſanguine Chriſti; quia Chriſtus eſt agnus Dei.* You would have ſmiled, if you had heard him.

Mr. Anthony Smith *to Mr.* Ro. Boyle.

Exon, Feb. 28, 1667.

Truly honoured Sir,

THE unqueſtionable aſſurance you have given the world, that it is your work to glorify your Maker, and manifeſt true love to mankind in your indefatigable pains, vaſt expence, and benevolent mind, ſo freely to communicate what your unparallel induſtry by ſearch, your judicious obſervation by trial, and your capacious mind by improvement, have found beneficial to mankind: theſe with the advantages I have had by your eſſays, and other writings (which you ought to have the comfort of) and my preſent neceſſity, have levelled all the mountains, that were in my way to you. Worthy Sir, this is the caſe. Here is a gentlewoman of *Woodbury*, ſix miles diſtant, who hath laboured with a cancer in her right breaſt theſe eight or nine years, in the uſe of variety of means to ſmall purpoſe, at length nature ſeemed to make a ſeparation between the cancerated and ſound breaſt,

breaſt, ſuch as you often ſee where a cauſtick hath been applied, the eſchar divides between the living and the dead; this was taken off by a certain empirick in *Somerſetſhire*, but a few months after it riſeth again with renewed ſtrength, and then the whole breaſt was taken off by my hand, with ſome portion of the muſculus pectoralis, upon which it is placed; the moſt ſuſpicious places cauteriſed with actual and potential cauteries. Upon this ſhe continues well ſome years, brings forth a child, nurſed it with the other breaſt, weans her child, has the benefit of nature monthly, conceives again, brings forth a ſecond birth, ſends this babe to nurſe abroad; after a year or two the old cicatrix begins to heave up with a hard compact body, like the kidney of an ox, which made haſte to ſhew itſelf, and began to heave up the cutis (which did adhere faſt to the ribs before) and though looſe under, yet began to pain. Addreſs being made to me, I opened the part, and took it out, which was in a few months grown as big as any ordinary fiſt: this alſo was well in a ſhort time, and ſo continued for two years and upward: but about laſt Whitſuntide ſhe felt a little pain, and found a ſmall collection very hard and deep in, as if it lay between the ribs in the intercoſtal muſcles; this we obſerved, and often ſtirred to keep it from fixing, which was hard to do. At length it became very painful, and grew like a fungus, and ſpread every way up under the armpit to a vaſt magnitude; ſo that we were forced Saturday the 15th inſtant, in the preſence of Dr. *Thruſton*, to take it off, which is the fourth time ſhe hath felt this dreadful operation. I have applied oleum vitriolum to the roots; the eſchars are deep, for I began them with lixivium ſaponis, and touch them over with cauſtick oils every day. Now honoured Sir, having read in your Eſſays, Part II. pag. 112. that you have a friend, that hath ſome arcanum in the caſe, give me leave to beg your help. I have heard, that you have ſome rare elective vomit, that frees the body from this noxious humour: ſuch things you have helped me to believe there are, by what I have experimented in your Eſſays, and did I not fear I ſhould be denied all by aſking too much at once, I would pray for ſome light into your ens Veneris, but I forbear, hoping to live to ſee you once more. Let me beg leave to tell you what muſt needs delight you. I have had the greateſt and moſt undeniable ſucceſs with the uſe of your paronychia rutæ foliis, (I ſuppoſe) that ever you ſaw, upon a perſon of ſome quality, who had a very great tumour in the pharynx, filling up all that capacity under the tonſillæ from ſide to ſide, even externally to the parotydes hindring ſpeech, breath, and ſwallowing too; which to admiration, to my great comfort, and profit, are all vaniſhed; and although they were ſome years collecting, they came to ſuppuration like a common natural phlegmon, and wanted little more than dry lint to heal them. But I ſuppoſe the gentlewoman uſed more than a buſhel of that ſmall plant, for I made ſyrup of it to uſe in the latter part of the ſummer and winter when the plant cannot be had; and I am confident thoſe, that fail of a cure, it is becauſe they are weary of the medicine, before the maſs of blood hath received any conſiderable alteration from it. I could ſay a great deal of this and your ref. jalapii, pil. lunares, *&c.* But I am too bold, I beſeech you excuſe me. I ſhall beg the bearer to receive a line or two from you; for our eyes are upon you, under God, for ſome relief in this great caſe; mean while reſt,

SIR,

your real ſervant (were I able),

ANTHONY SMITH.

Dr. Sydenham *to Mr.* Robert Boyle.

Pall-Mall, April 2, 1668.

SIR,

IT had becomed me to have begged your acceptance, when I took the boldneſs to tender to you the ſecond edition of my book; but partly buſineſs, and partly an unwillingneſs in me to give you two troubles at once, diverted me from writing. But now that you are pleaſed to give yourſelf the pains of a thanks, which I never thought my ſelf capable of deſerving from you, I hold myſelf obliged to return you my humble thanks, that you take in good part my weak endeavours, and are pleaſed to have a concern (as you always have done) for me. I perceive my friend, Mr. *Locke*, hath troubled you with an account of my practice, as he hath done himſelf in viſiting with me very many of my variolous patients eſpecially. It is a diſeaſe, wherein as I have been more exerciſed this year than ever I thought I could have been, ſo I have diſcovered more of its days than ever I thought I ſhould have done. It would be too large for a letter, to give you an account of its hiſtory; only in general I find no cauſe, from my beſt obſervation, to repent of any thing ſaid by me in my tract *De Variolis*, but do greatly, that I did not ſay, that, conſidering the practices, that obtain, both amongſt learned and ignorant phyſicians, it had been happy for mankind, that either the art of phyſick had never been exerciſed, or the notion of malignity never ſtumbled upon. As it is palpable to all the world, how fatal that diſeaſe proves to many of all ages, ſo it is moſt clear to me, from all the obſervations that I can poſſibly make, that if no miſchief be done, either by phyſician or nurſe, it is the moſt ſlight and ſafe of all other diſeaſes. If it ſhall be your hap to be ſeized of that diſeaſe (as probably you never may) I ſhould recommend to you, upon the word of a friend, the practice mentioned in the 155th page of my book. I confeſs, ſome accidents there are incident

incident to that diſeaſe, which I never was able to maſter, till towards the end of the laſt ſummer, and which therefore could not be mentioned by me, as a phrenitis coming on the eighth day, where the patient is in the vigour of his youth, hath not been blooded, and hath been kept in a doſe from his firſt decumbiture; as likewiſe (which is wont to be no leſs fatal) a great doſing, accompanied with a choaking reſpiration, coming on from the tenth day (reckoning from the rigour and horror, which is my way of accounting) and occaſioned by the matter of a ptyaliſm in a flux-pox, baking and growing thick, as it declines and comes to a concoction in thoſe days. But, which is obſervable, the ſmall-pox never fluxes or runs together, but it hath been thruſt out before the fourth day; and where you ſee any eruption the firſt, ſecond, or third day from the decumbiture, you may ſafely pronounce, it will be a flux-pox, or a meaſle, for that ſort in its firſt appearance is like it; and, which is likewiſe obſervable, in the higheſt flux of all, as that which comes out the firſt or ſecond day, it is in vain to endeavour the raiſing them to an height, for it is both impoſſible and unſafe to attempt, but all the diſcharge, that can be, muſt be either from a ptyaliſm, in a grown perſon, or a diarrhœa, in an infant, to whom the ſame is no more dangerous than the other to the former. And wherever they flux, their diſcharge muſt be made one of thoſe two ways. But of theſe things I ſhall diſcourſe to you more at large, when I ſhall have the happineſs to ſee you, which I hope may be ſuddenly. The town ſtands well in health, and at our end not any body ſick, that I hear, of the ſmall-pox. I have much buſineſs about other things, and more than I can do, who yet am not idle. I have the happineſs of curing my patients, at leaſt of having it ſaid concerning me, that few miſcarry under me; but cannot brag of my correſpondency with ſome other of my faculty, who, notwithſtanding my profoundneſs in palmiſtry and chemiſtry, impeach me of great inſufficiency, as I ſhall likewiſe do my taylor, when he makes my doublet like a hop-ſack, and not before, let him adhere to what hypotheſis he will. Though yet in taking fire at my attempts to reduce practice to a greater eaſineſs and plainneſs, and in the mean time letting the mountebank at *Charing-Croſs* paſs unrailed at, they contradict themſelves, and would make the world believe I may prove more conſiderable than they would have me. But to let theſe men alone to their books, I have again taken breath, and am purſuing my deſign of ſpecificks, which, if but a deluſion, ſo cloſely haunts me, that I could not but indulge the ſpending of a little money and time at it once more. I have made a great progreſs in the thing, and have reaſon to hope not to be diſappointed. My occaſions will not ſuffer me to give you more trouble, and therefore be pleaſed to accept of the tender of thoſe very unfeigned thanks, which I here make you, for all the ſingular kindneſſes and favours whereby you have obliged me to be very uncomplimentally,

SIR,

Your moſt humble ſervant,

T. SYDENHAM.

G. Agricola *to Mr.* Robert Boyle.

Tonningen, April 6, 1668.

Noble Sir,

I PRAY you excuſe my boldneſs, for troubling you with this letter, but I hope your civility will pardon my fault. It is almoſt ten years ago, ſince I went out of *England*, and as I dwelt with Mr. *Frederick Clodius*, I had the happineſs and honour to ſee your nobleneſs, and to wait upon you in our laboratory, and afterwards coming into *Holſatiam*, I have ſeveral times, very honourably, remembered your great ſkill in philoſophia experimentali to our learned doctors and noblemen; but as I got one of your books, *viz. Chemiſta Scepticus*, I performed that fame, which I had ſpoken of you, and every one learned man deſireth to read your learned books, and wiſheth, that the Lord in heaven may ſave you long to ſerve *in publicum bonum*. Some of your writings we have got more, *viz. Experimenta Phyſico-Mechanica, et defenſionem contra Linum*; *tractatum de Coloribus: Tentamina quædam Phyſiologica*; *Hiſtoriam fluiditatis et firmitatis*; Some Conſideration touching the Uſefulneſs of Experimental Natural Phlioſophy; and daily we read in the *Journal des Scavans* of your great experiments; ſo that your nobleneſs cauſeth, that the lord *Jean Samuel Heiſterman de Vilberg* (which being by our highneſs the duke of *Holſtein*, his ſecret counſellor and of ſtate, and præfectus provinciarum, *Eideroſtadæ*, *Everſhap*, and *Utholm*, a very noble man, and a great ſcholar, loving phyſick, chemiſtry, and many other gallant experiences) did deſire of me to take the boldneſs to write to you, and to remember his duty to you, though yet unknown to you, and to tell you a ſtrange accident, as followeth.

ONE of his greyhounds being tormented ſuddenly three days together with great pains in his guts with vomiting, he died the third day of this month *April*, and this nobleman deſired of the hangman's ſervant, that he might open this dog in a ſtable of the court at *Tonningen*, where this dog did die, and there were preſent by this opening, 1. myſelf. 2. our *Secretarius Provincialis frater germanus domini Heiſtermanni*. 3. his ſteward. 4. his hunting-man. and 5. his coachman. But *conſiliarius Heiſterman* was called for *Gottorp* to the duke. And all the internal parts of this dog's body were found very wholeſom, and every part was cut in pieces with a knife, and there was no where yet, neither in the brain, found any

cauſe of his great torments and ſuddenly, except *in veſicula fellis, quæ totaliter bile erat repleta, et valde tranſparens, in medio autem veſicæ tranſparebat corpus quoddam candidum; itaque juſſi incidere veſicam fellis, et ecce prodibat fruſtulum de teſta oſtreæ recens adhuc, ac interne ſplendens more ſolito; magnitudo ejus parum excedebat nummum Anglicanum* a ſix-pence, *eratque in margine valde acutum.* Now I remember, that doctor *Needham* writeth (in his book called *Diſquiſitio Anatomica de formato fœtus,* and which he hath dedicated unto you) *contra Bilſium, quod nullus chylus deferatur per venas meſeraicas vulgares et lacteas ad hepar; et hic quæritur, per quas vias tranſiverit fruſtulum de teſta oſtreæ ad veſicam fellis. D. Van Hoorne profeſſor in academia Lugdunenſi ſcribit quidem in ſuo prodromo obſervationum de partibus generationis hæc verba; Coronidis loco hoc addam, oculari demonſtratione me exhibere poſſe ingreſſum chyli in venas meſeraicas vulgares. Hactenus Van Hoorne: quod ſi hoc verum eſſet, tum ſtatica daretur via per ramum venæ portæ ad hepar, et ſic ad veſicam fellis, quamvis nulla tam ampla vaſa in meſenterio reperiantur; ſed hæc, nobiliſſime domine, tuo judicio et acutiſſimo ingenio ſubjicimus.* Moreover deſireth the lord *Heiſterman*, if your nobleneſs would be pleaſed to ſend an anſwer upon this queſtion, and he wiſheth to be ſo happy, and to be hence acquainted with you by letters: laſtly he deſireth (becauſe he did read it in the *Journal des Sçavans*, that in *England* ſhould be very good magnifying glaſſes or microſcopia) and beggeth, if poſſible, to have the honour of your nobleneſs, and to be inſtructed of you, where the beſt magnifying glaſſes are to be got in *London*, and ſo ſoon as I get an anſwer of you, where ſuch microſcopia are to be ſold, and what they coſt, then Dom. Præfectus will give preſently order to a certain merchant in *London*, which ſhall buy one or two for him. But, Sir, I beſeech you not to take it unkindly, that we are troubleſom to you; and if we can do you any favour or ſervice in our countries, we ſhall be not only willing, but always expedient to ſerve you. No more for this time, but that the Lord in heaven may bleſs you for ever.

SIR,

Your moſt humble ſervant,

Johannes Chriſtianus Agricola,

med. doct. et poliater Tonningenſis.

POSTSCRIPT.

I PRAY you, Sir, not to take it evil, that I do write to you in Engliſh, though it be not written according to the rules of your Engliſh maſters; but the reaſon is, I would not forget my Engliſh; and if I ſhall have the honour to expect an anſwer of you, I pray you would be pleaſed to add where you dwell now at this preſent time in *London*. *Vale.*

Mr. Thomas Coxe *to Mr.* Robert Boyle.

Rome, May 2, 1670. N. S.

Honoured Sir,

IN that application I ventured to make to you from *Venice*, I had not the vanity to pretend, that ſo ſmall an expreſſion of my duty ſhould receive ſo noble a reward, as that of your letter by this laſt poſt: but ſince you are pleaſed ſo favourably, and with ſo great condeſcenſion to encourage my zeal to your ſervice and patronage; I cannot be ſo unconcerned to my own advantage, as not to make much of your preſent favours, and wiſh the continuation of them for the future.

I HUMBLY thank you for the honour you have done me, of communicating to me his majeſty's curioſity to ſee and know ſome of your own experiments, performed in his preſence by your own hand; and that the king is like to be ſo great a patron of the virtuoſi, as to bring their concerns into his houſe, and to liſt them of his family. I pray God Almighty confirm his majeſty in theſe generous reſolutions, of encouraging the young nobility of the nation to virtue, true gallantry of mind, and all excellent knowledge, by the powerful motive of his royal example.

WE have been for ſome months in great expectation of what the conclave would produce, which hath been ſhut up ever ſince December 20, N. S. 1669, and were in great danger either of leaving *Rome* without a pope, or of being forced to expect the creation of one all this ſummer, to the hazard of our health, and diſappointment of our future deſigns in other parts; the two great oppoſite factions of *France* and *Spain*, and the third of the ſquadrone volante (unable either to balance or reconcile the former) remaining ſo ſtiff and unalterable in their different parties, as gave us little hopes of any timely agreement.

BUT on Tueſday laſt, April 29, N. S. we were moſt unexpectedly ſurpriſed at dinner, with the news of the election of cardinal *Altieri*, a *Roman*, who was the very firſt perſon propoſed after the entry into the conclave. About five in the afternoon the ſame day, he was proclaimed to the people, by the name of *Clemens* X. and preſently after received the keys and adoration of the cardinals in St. *Peter's*. He is a man of eighty one years of age, of the laſt pope's promotion to the cap, and was ſome time his M^ro. di Camera: His election paſſed with the votes of all the cardinals but one, as a convenient perſon, becauſe of his age, and indifferency to all factions, to depoſite the popedom with, for ſome little time.

HE hath no nephew, but has reſolved upon monſieur *Pallutti* (his near relation) for cardinal patron, upon monſieur *Carpegno* for ſecretary; but is yet uncertain in the choice of his M^ro. di Camera, and Datario. It is hoped we

may ſee his coronation on Sunday next, and the grand cavalcade on that day ſevennight.

FATHER *Kercher*, the marcheſe *d'Olivala Maleſpina*, ſignior *Carlo Mancini*, and other virtuoſi in this city, do me the honour to ſpeak to me often of your name, and of your excellent treatiſes and experiments. I humbly pray the favour of you to give order, that ſome of thoſe you have lately ſhewn the king, be communicated to me, that I may do myſelf the credit with theſe gentlemen of giving them the account and relation of them. I have no other requeſt to add, but to beg the tender of my moſt humble duty and ſervice to my lady *Ranelagh*, and the young ladies; with my acknowledgments for this noble favour conferred upon,

Honoured Sir,

Your moſt humble,

and moſt obedient ſervant,

THOMAS COXE.

Honoured Sir,

As I am putting up this letter, I hear, that this parola (or morning-audience) the pope hath declared monſieur *Borromeo* (at preſent nuncio in *Spain*) his ſecretary of ſtate; monſieur *Maſſimi* his M°. di Camera; and monſieur *Carpegno* his pro-datario.

Mr. Leonard Hoar *to Mr.* Robert Boyle.

Cambridge, New-England, December the 13th, 1672.

Right honourable,

YOUR freedom and courteous treating me, when hither coming, giveth me the hardineſs to preſent you with my acknowledgments, although it be but your interpellation; judging it better, that I were cenſured for troubleſomneſs, than for ingratitude. Yea the chiefeſt of this colony, a poor, but yet pious and induſtrious people, know and acknowledge your kindneſs often and on conſiderable occaſions expreſſed towards them, in their juſt defences, *&c.* although they know not where or how to publiſh their tabula votiva, or memorials of it unto your acceptation, but ſtill do gratefully recommend you and your well-devoted labours in their prayers to God; and any publick affair them concerning, that ſhall unexpectedly emerge unto your prudence, love and candor, hoping, that nothing ſhall ever be believed or concluded againſt them before that they be heard.

NOBLE Sir, I am not unmindful of your deſires to ſee what rarities the country might yield; and have taken courſe, that now be preſented to you, firſt, a ſort of berries, that grow cloſely conglomerated unto the ſtalk of a ſhrub, in its leaf, ſmell and taſte, like the broadeſt leaved myrtle, or to a dwarf-bay; which, by plain diſtillation, yields an almoſt unctuous matter; and by decoction, not a reſina, nor oil, but a kind of ſerum, ſuch as I have not known ordinarily for any vegetables. I believe it excels for the wind-colick.

THOUGH I thought myſelf an indifferent botaniſt for any thing could grow in *England*, yet here in our wild plants I am preſently [at a loſs] but I hope I ſhall in ſeaſon ſearch out their pedigrees; and would be free to gratify any perſon valuing them with their ſeeds, or bodies dried. Mr. *Alexander Balaam*, my maſter in thoſe ſtudies, and a perſon well known to Mr. *Charles Howard* and Dr. *Morriſon*, are now in your land.

ALSO (pardon, I beſeech you, the confidence) I make bold to preſent your honour with a model of our natives ſhips. With one of them twenty foot long they will carry ſix or eight perſons, their houſe and furniture and proviſions, by one padling her forwards in the ſtern, ſwifter than any ſculler. And when they come to falls, or would go over the land, [the paſſengers] load themſelves away with the ſhip and her freight too.

I DOUBT they are not for the wars; for if you but ſtamp hard, you may ſtrike out the bottom; and if you lay your tongue on one ſide of your mouth, it may over-ſet.

ALSO Sir, a piece of their plate, a fiſh I call the ſea-ſpider, and ſome ſtones, I doubt more ponderous than precious; but that your honour will prove.

IT hath pleaſed even all to aſſign the college for my Sparta. I deſire I may adorn it; and thereby encourage the country in its utmoſt throws for its reſuſcitation from its ruins. And we ſtill hope ſome helpers from our native land; of which your honoured ſelf, Mr. *A.* and ſome others have given a pledge.

A LARGE well-ſheltered garden and orchard for ſtudents addicted to planting; an ergaſterium for mechanick fancies; and a laboratory chemical for thoſe philoſophers, that by their ſenſes would culture their underſtandings, are in our deſign, for the ſtudents to ſpend their times of recreation in them; for readings or notions only are but huſky provender.

AND, Sir, if you will pleaſe of your mature judgment and great experience to deign us any other advice or device, by which we may become not only nominal, but real ſcholars, it ſhall, I hope, be as precious ſeed, of which both you and me and many by us ſhall have uberous provent at the great day of reckoning, which I know you do reſpect above all.

IF I durſt, I would beg one of a ſort of all your printed monuments, to enrich our library, and encourage our attempts this way.

I KNOW nothing ſo ſtunting our hopes and labours in this way, as that we want one of a ſort of the books of the learned, that come forth daily in *Europe*, of whoſe very names we are therefore ignorant.

To Mr. *Aſhhurſt* I have written more. Let not, I beſeech you, my prolixity tire or deter your.

your acception of things hinted, or your honour's condonation of

Your devoted humble ſervant,

LEONARD HOAR.

Dr. Robert Plot *to Mr.* Robert Boyle.

Oxon, July 21, 1674.

Honoured Sir,

HAD I not met with ſomething in my travels like to prove conſiderable, I ſhould not have preſumed to trouble you with theſe, though few lines. About three weeks ſince being in queſt of a ſalt ſpring I heard of near *Deddington* in *Oxfordſhire*, I happily made enquiry of a perſon, who told me, that beſide the ſalt one, they had another in the town of an unuſual and very ill ſmell; whereupon I went with him, and found its ſcent to come neareſt that of water, which has been uſed in the cleanſing of a very foul gun, of any thing I can yet ſpeak of; this ſmell, though ſomewhat offenſive, yet the water is clear and potable enough. Next day I made ſome experiment of it, and found after ſeveral trials, that two grains of the powder of galls would turn a whole gallon of a reddiſh colour inclining a little to blue; which after a quarter of an hour would of itſelf (which I much wondered at) as it were curdle, and then changing colour to a deep purple, fall to the bottom of the vial. This ſediment, after filtration and exſiccation, I put upon a red hot iron, and found it after a while to take fire with a quiet ſcintillation, by which I gathered there might be ſome ſmall quantity of nitre, but wondered (as I do ſtill) that no ſulphur (which ſufficiently ſhewed itſelf in the odour of the water) did not alſo betray itſelf in this operation. On another parcel of this ſediment I put aqua fortis, which do work (though but weakly) upon it, by which I collected there might be ſomething alſo of iron. Next day I diſtilled it with an eaſy heat, and neither that, which came over, or which remained in the glaſs body, after half a pint was diſtilled, retained any ſmell, taſte, or other properties, that might diſtinguiſh it from ordinary ſpring-water diſtilled; for permitting the fire to extinguiſh to try what kind of precipitate would fall; and filtring the remaining part of the water to get the ſediment, I found, that neither that, which came over, or what remained, kept the ſame ſmell, or would give any tincture with galls, as it did before ſeparation from the ſediment, which being dried, was nothing neither but an inſipid pale red calx. This I could have tried ſeveral ways, but the town yielding neither ſpirits or oils fit for the purpoſe, I left the place, and continued my journey, but with this contentation from what I then ſaw, that it comes very near (that I ſay not wholly up) to the German Spa water, if its anatomy, that I have met with in ſome authors, be rightly laid down. However, I think I ſhould ſcarce have given you the trouble of this account, but that I hear ſince it has ſo far prevailed, that ſeveral perſons, and that of quality, have left Aſtrop waters for this, and that of all ſorts, there have been to the number of forty perſons drinking at a time. Several other natural things of uſe and value I have met with in this county, which in ſhort are theſe: a ſpungy white earth, which from its uſe we may call native lime, for without the help of fire it has been uſed not only to point walls, but to white ceilings with good ſucceſs: it does not ſlake like lime in the water, and therefore I take it to be the gypſum nativum of *Euſebius*, or rather the ſame ſort of gypſum, which *Pliny*, Lib. XXXVI. cap. 24. calls gypſum Tymphaicum, which he ſays is digged, e ſummâ tellure, and ſo is this. 2. I have met with a ſort of ſand ſo indiſtinguiſhable from that we call Calais ſand, that it has been ſold for as much (becauſe for uſes as good) as that commonly is, that is by retale for one penny per pound, which amounts to about 1 *l.* 5 *s.* the buſhel. 3. A tolerable good umber, which the glovers like pretty well to colour their wares with. 4. The hooping bird, and a linnet perfectly white. 5. A Roman pavement, called by Pliny, Lib. XXXVI. cap. 25. Lithoſtratum: theſe pavements he ſays were made parvis e teſtulis, tinctiſque in varios colores, and ſo is this ploughed up in this county of *Oxon*. I have not forgotten to obſerve the variation of the compaſs, according to your deſire, but fear I have been leſs accurate in this, becauſe I find the cabin compaſs, which you adviſed me to buy, to be much too little; and by reaſon of its roundneſs, unfit to lay to the meridian line, when found. I believe therefore, that a compaſs might be continued purpoſely for this uſe, with a needle of five or ſix inches long, ſet in an oblong box, whoſe ſide ſhould be exactly parallel to the line of north and ſouth: the needle need not play above thirteen or fourteen degrees on each ſide the points, the variation never being more. I would have the needle alſo to be taken off and put on at pleaſure, to prevent ſpoiling in my journies. I have met with ſeveral other curioſities in huſbandry, plants, ſtones, antiquities, *&c.* too long to trouble you with now. I ſhall therefore add no more, but that I am,

SIR,

your moſt faithful ſervant,

ROB. PLOT.

Dr. Thomas Marſhall *to Mr.* R. Boyle.

Lincoln-College, Oxon, Oct. 24, 1676.

Honoured Sir,

YESTERDAY I received from Mr. *Davis*, our bookſeller, an unexpected token of your favour, which is ſo much the greater,

greater, as being conferred upon one, who hath never had the opportunity to deſerve any part of that honour. Sir, as you have been thus pleaſed to bring me into a new debt, ſo my humble requeſt is, you will help me to diſcharge it, by commanding my poor endeavours in your Malayan, or any other noble deſign; wherein I may expreſs myſelf to be,

Worthy Sir,

yours ever obliged

to ſerve and honour you,

THO. MARSHALL.

Mr. Luke Hodgſon *to Mr.* Robert Boyle.

SIR,

IN my laſt to my couſin *Killingworth*, I deſired him (not knowing, who is preſent ſecretary to the Royal Society) to give you a letter long ſince ſent to Mr. *Oldenburg*, in anſwer to ſome doubts concerning our ſubterraneal fire near *Newcaſtle*; and I waited my friend's anſwer (in which I expected to underſtand, how ſatisfactory my reaſons therein were to the Royal Society) had not the ingenious Mr. *Samuel Hutchinſon*, now reſiding with us, perſuaded me rather to write more immediately to yourſelf, and to acquaint you, that it is not altogether the many buſineſſes he has to do, that prevents his writing; but the deſire he hath firſt to be able to preſent you with ſuch various ſorts of lead and other ſorts of ores he hath melted down in the firſt furnace he hath built, and then he intends at large to give you an account of the ſucceſs of his undertakings. Only at preſent he deſired me to inform you, that the ſalts of the fire, and other ſalts to be had in great plenty here, are ſufficient to furniſh him with fluxes at the rate of a farthing a pound, which will do his buſineſs as well as tartar peter, or pot-aſhes. He gave me alſo the two following certificates from perſons of good credit, who were preſent, when he melted down ſeveral ſorts of lead ores, and ſlag of lead ores, into good malleable lead, ſeveral of which I ſaw myſelf; and ſuppoſe by what ſmall trial I made to be as ductile, malleable, and as unapt to crack as any lead we have here; ſo that if it ſucceed at the ſame rate in larger quantities as it doth in this furnace, there are none with us doubt of the ſucceſs of his undertaking. Neither is that any ſcruple with me, but rather, that his larger furnaces may ſpend coal to no purpoſe, for want of ſufficient quantity of ore to ſupply them. Sir, I doubt not but when Mr. *Hutchinſon's* buſineſs is ſettled, we may be able to furniſh you with an account of ſuch various experiments, as may be uſeful to all, who deſire to penetrate into the dark receſſes of nature, which will collaterally fall out in this work. What remains is to beg your pardon for this trouble, and to deſire as a token thereof, you will pleaſe vouchſafe two or three lines to

your much humble ſervant,

LUKE HODGSON.

MEMORANDUM. That this 5th of April 1678, we were at *Sam. Hutchinſon's* houſe at *Walſende* near *Newcaſtle*, where he had built a furnace in his brewhouſe, and there ſaw him melt down both lead ore and ſlag of lead into good and malleable lead, with ſea-coal, without any wood, or wood-coal, and do conceive it may be a good and profitable invention, eſpecially in this country, where coals are ſo cheap and plentiful.

HENRY BLAND,
CHRISTOPHER HUTCHINSON,
THOMAS HALL,
WILLIAM HINDMARSH,
HECTOR GILLROY.

WE, whoſe names are here ſubſcribed, were preſent at the houſe of *Samuel Hutchinſon* at *Walſende* near *Newcaſtle*, where he had built a furnace in his brewhouſe, and there ſaw him make an effectual demonſtration in melting down lead-ore with ſea-coal, only without any wood or wood-coal, into good malleable lead, rather better and cloſer, and more ſoft than we have ſeen in their ordinary way, and conceive the ſame to be a very profitable invention. Dated this of April 1678.

ROBERT DELAVAL,
RICHARD HINDMARSH,
RICHARD COLE.

The earl of Burlington *to Mr.* Ro. Boyle.

Londeſburgh, Aug. 24, 1681.

My deareſt brother,

I SHALL in this enquire after your health, in which I heartily wiſh you may find a conſtant improvement, and that the violence of the ſmall pox may be ſo much abated, that you may return to your *London* apartment, where I hope about the end of the next month, or very ſoon after, to wait upon you; though I muſt confeſs unto you, that my reſidence here is not at all diſpleaſing unto me. We long to hear to what place or country the French king will this ſummer addreſs his armies: if to *Caſall* he will certainly alarm all *Italy*, if they be not in a deep lethargy: if he intends only to enlarge his conqueſts by meering and bounding, *Flanders* is the moſt proper place for that kind of acquiſition, ſince he has nothing to do but to aſk, threaten, and have what he pleaſes to demand, which is certainly a very eaſy way of getting, as it is a new one. I am heartily ſorry he extends his power againſt the poor proteſtants with ſo much vigour; but God, who puts a bound to the raging

raging of the ſeas, can put a hook into his noſtrils when it is his good pleaſure. My wife and grandchildren are your moſt humble ſervants, and I am

Yours moſt faithfully,

BURLINGTON.

Dr. Hutton *to Mr.* Robert Boyle.

Paris, Sept. 1, 1682.

SIR,

THE incloſed is from monſieur *Lemery*, who ſends you his book of the fourth edition, with a preface of a conſiderable work in anatomy by two phyſicians of *Geneva*, an account of whom you may have at large from my worthy and learned friend Dr. *Hamilton*, governor to my lord *Gorenbury*, who hath been intimate with the authors, and witneſs to much of their labour theſe four years paſt, and pleaſed to favour himſelf and me to carry this to your hands. It is like, I am out of your remembrance, it being ſome few years ago ſince I had the honour to be with you at your houſe in the *Pall-Mall*, *London*: however, I will think myſelf happy, if I could render any ſervice to you here, or when elſewhere. The bearer can give you my addreſs, if you think fit to ſend a return to monſieur *Lemery*. I continue,

SIR,

Your moſt humble ſervant,

HUTTON.

Incloſed in the preceding.

A Paris, ce 17 Aouſt, 1682.

Monſieur,

PArdonnez, s'il vous plaiſt, a la liberté, que je prends de vous eſcrire, ſans avoir l'honneur d'eſtre connu de vous. Je n'ignore point la grande reputation, que vous vous eſtre acquiſe, & je ſerois venu de l'autre monde, ſi je ne ſçavois que vous eſtre l'oracle des ſciences. Il y auroit long temps que j'aurois pris cette hardieſſe, ſi je n'euſſe eſperé avoir l'honneur de vous voir a Londres, mais preſentement je ne ſcay pas ſi j'iray, j'ay trouvé l'occaſion d'un ami, qui s'eſt bien voulu charger de ce petit paquet. Vous y trouverez dedans la preface d'un grand ouvrage anatomique, qu'ont entrepris deux medecins de Geneve; ils demandent avis a tous les ſcavans de France, d'Angleterre, & d'Hollande ſur leur deſſein; je l'ay accompagnée d'un exemplaire d'un traité de chymie, que j'ay compoſé. Vous en aurez, peut eſtre oui parler, puis qu'on la traduit en Anglois: c'eſt une 4. edition, où j'ay adjouſté beaucoup de choſes: il ſera bien heureux, s'il trouve place dans voſtre bibliotheque: ce ſera un grand honneur pour luy, & l'autheur vous en aura beaucoup d'obligation. Je ſuis avec reſpect,

Monſieur,

Voſtre tres humble, &

tres obeiſſant ſerviteur,

LEMERY.

Dr. Robert Toope *to Mr.* Robert Boyle.

Bath, April 5, 1683.

Honoured Sir,

SINCE my return into the country, I have been very ill in a fever, or elſe this had (to promiſe) flown ſooner to your hands. In the year 1678 about the latter end of February (I then lived in *Marlborough*) I was ſent for to one Mrs. *Corle* of *Freſhford* near *Bath*, who laboured in a fever; and I took in my pocket a whole ounce of Spaniſh flies pulveriſed *groſſo modo*, for I uſually draw bliſters with little bags; and after I had filled two or three bags, which could not contain above a drachm, I lapped all up in a double paper, and ſtuck it between an iron bar and the glaſs in the gentlewoman's chamber window, the window looking towards the ſouth, and I went off and left my flies as before. About thirteen or fourteen months after, April or May come twelve month, I was ſent for to one Mr. *Sloper* of *Tunbridge* (three miles from *Freſhford*) brother to the gentlewoman Mrs. *Corle*; and when I came I found my patient Mrs. *Corle* there, I told her I muſt bliſter her brother, and ſpoke to have the apothecary ſent for, on which ſhe told me ſhe could have brought old ones, if not young ones enough; for ſaid ſhe, cleaning my chamber window two days ſince, I took down a paper of Spaniſh flies you left there ever ſince my laſt ſickneſs; and when I opened your paper, there was multitudes of little flies like your old ones; and being afraid of their motion, I haſtily and rudely lapped it up again, and put the paper where I had it. Then I grew warm and impatient to ſee the phœnix from its aſhes; ſhe freely offered her man to fetch me the paper, which I accepted of, and then ſaw with my own eyes, and many others beſides myſelf, thouſands of them creeping and crawling about moſt exactly ſhaped to the old flies, long and ſmall their wings, as long as their bodies, but of a very faint glittering and ſhining colour. I kept ſome of them in boxes with fruit and leaves, and they waxed bigger; and the bigger they grew, various colours came on. My children obſerving my often viſiting and feeding my little fry, in my abſence deſtroyed my ſtock.

I PRAY, Sir, give me a taſte of that bleſſed oil, of which you promiſed the way of confecting; and that of refining tin given you by one *Wilden* as I take it, for I reſolve to work upon that body, ſo much have I ſeen to encourage me; and when I am at a loſs or ſtand, I ſhall beg your aſſiſtance, and whatever I do in this kind or any other way, I will communicate and return it back again, as the little rivulets pays the main ocean.

SIR, you muſt pardon the rudeneſs of my long nonſenſical ſtory; but, if I miſtake not, ſuch ſtories as theſe ought ſo to be told, that no ſuch circumſtances be omitted, for many times the whole matter lies couched under circumſtances (though the caſe does not here

ſo appear) you may give it what philoſophical dreſs you pleaſe. Worthy and honoured Sir, I am

Yours to command,

ROBERT TOOPE.

To me at the poſt-houſe in *Bath*, *Somerſetſhire*.

Viſe remitte vale.

Mr. William Penn *to Mr.* Robert Boyle.

Philadelphia, Aug. 5, 1683.

My worthy friend,

I COULD not let my agent go without a letter directed to ſo worthy and ingenious a friend; though I can ſay little, that may add to the ſmall account I gave in another letter: only the natives, ſome oar, and ſome flowers and plants I will touch upon. I find them a people rude, to Europeans, in dreſs, geſture, and food; but of a deep natural ſagacity. Say little, but what they ſpeak is fervent and elegant; if they pleaſe, cloſe to the point, and can be as evaſive. In treaties, about land, or traffick, I find them, deliberate in council, and as deſigning, as I have ever obſerved among the politeſt of our Europeans. I have bought two large tracts, and had two preſented me, which coſt me alike. However, in this they are happy, and even with us, they care and want for little; and if they have not had their paſſions raiſed to the ſame degree after the luxury of *Europe*, by like enjoyments, neither have they the anxieties, that follow thoſe pleaſures. They trouble not themſelves about bills of lading, or exchange; nor are they moleſted with chancery ſuits and exchequer accounts. Their reſt is not diſturbed for maintenance; they live by their pleaſures, fowling and fiſhing; the ſons of providence; better without tradition, unleſs that they have got had been better; for the Dutch, Engliſh, and Swedes have taught them drunkenneſs. Thus they are the worſe for thoſe they ſhould have been the better for; and this they are not ſo dark as not to ſee, and ſay. So that the low diſpenſation of the poor Indian out-ſhines the lives of thoſe Chriſtians, that pretend an higher.

OF oar, here are divers ſorts. I have ſent a little, to ſpend thy judgement upon, which I have delivered to my kinſman, captain *Markham*, to put into thy own hands.

OF plants, here are excellent for medicine and cure of wounds. Some chemiſts intend an obſervation upon them. But immediate cures have been wrought moſt certainly.

OF flowers, I may ſay, I never ſaw larger, more variety, richer colours, in the curious gardens of *England*. Of theſe I have ordered my gardener to make a collection againſt the next year. I have a garden prepared by kitchen-ſtuff this year, of two acres, for that and other ſervices. Our town goes on apace; twenty houſes got up ſince my laſt, I ſuppoſe. God has preſerved our health, during the greateſt heats and rains, the oldeſt inhabitant remembers. But the corn, which was plentiful, was firſt in; they reap about ſix weeks before us in *England*; I might ſay two months; for I ſaw barley cut on the third of May laſt.

I ADD no more, but if any thing from theſe parts may be agreeable to thee, uſe me freely; for of thy numerous friendſhips, no body is more ſenſible of thy worth, nor more affectionately than I am, without all reſerve,

Worthy friend,

thy cordial friend,

WILLIAM PENN.

PRAY give my reſpects to the lady *Ranelagh*. LET the bearer have thy favour and advice. *Vale.*

Mr. John Clayton *to Mr.* Robert Boyle.

Virginia, *James-City*, June 23, 1684.

Honoured and worthy Sir,

IN *England*, having peruſed, among the reſt of your admirable treatiſes, that ingenious diſcourſe of the Noctiluca, wherein, as I remember, you gave an account of ſeveral nocturnal irradiations; having therefore met with the relation of a ſtrange accident in that nature, from very good hands, I preſumed this might not prove unwelcome; for the fuller confirmation of which, I have encloſed the very paper colonel *Diggs* gave me thereof, under his own hand and name to atteſt the truth, the ſame being likewiſe aſſerted to me by madam *Diggs* his lady, ſiſter to the ſaid *Suſanna Sewall*, daughter to the lord *Baltimore*, lately gone for *England*, who I ſuppoſe may give you fuller ſatisfaction of ſuch particulars, as you may be deſirous to be informed of. I cannot but admire the ſtrangeneſs of ſuch a complicated ſpirit of a volatile ſalt and exalted oil, as I deem it to be, from its crepitation and ſhining flame: how it ſhould tranſpire through the pores, and not be inflamed by the joint motion and heat of the body, and afterwards ſo ſuddenly to be actuated into ſparks by the ſhaking or bruſhing of her coats, raiſes much my wonder.

ANOTHER thing I am confident your honour would be much pleaſed at the ſight of, a fly we have here, called, the fire-fly, about the bigneſs of the cantharides; its body of a dark colour, the tail of it a deep yellow by day, which by night ſhines brighter than the glow-worm; which bright ſhining ebbs and flows, as if the fly breathed with a ſhining ſpirit. I pulled the tail of the fly into ſeveral pieces, and every part thereof would ſhine for ſeveral hours after, and caſt a light round it. Be pleaſed favourably to interpret this fond impertinency of a ſtranger. All your

works

works have to the world evidenced your goodneſs, which has encouraged the preſumption, and it is that, which bids me hope its pardon. If there be any thing in this country I may pleaſe you in, be pleaſed to command; it will be my ambition to ſerve you, nor ſhall I ſcruple to ride two or three hundred miles to ſatisfy any query you ſhall propound. If you honour me with your commands, you may direct your letter to Mr. *John Clayton*, parſon of *James* city, *Virginia*.

Your humble ſervant, and,

though unknown, your friend,

JOHN CLAYTON.

Mr. John Percival *to Mr.* Robert Boyle.

Dublin, Oct. 28, 1684.

Honoured Sir,

I DID about a month ſince receive incloſed in a letter from Sir *Robert Southwell*, a bill of exchange for the ſum of two hundred and fifty pounds, drawn by you upon a gentleman in this kingdom, and payable to me, to be diſtributed to ſuch pious uſes (as Sir *Robert Southwell* informed) as you ſhould direct. Sir *Robert* told me alſo, that you intended ſhortly after to ſend me your inſtructions concerning the diſpoſal thereof. In expectation of which, I have the rather forbore to get the bill accepted, being willing to receive your orders, how to diſpoſe of the money, before I received it.

SINCE my coming to this place, I am informed, that according to the practice of merchants concerning bills of exchange, it may be a hazard unto the drawer of it, to let the bill lie long unaccepted; but which way I myſelf do not well underſtand, unleſs by the breaking of the party, who was to accept it, whereof I ſuppoſe there is in this caſe no danger. However, I am thinking as ſoon as I return home, to receive the money, and keep it ſealed up, till you pleaſe to order how it ſhall be diſpoſed of, wherein I deſire your inſtructions, which ſhall be very punctually obſerved by,

Honoured Sir,

your moſt faithful,

and very affectionate

humble ſervant,

JOHN PERCIVAL.

The earl of Perth *to Mr.* Robert Boyle.

Edinburgh, April 15, 1685.

Right honourable,

I SHOULD be aſhamed to acknowledge, that I know myſelf to be ſo much obliged to you, ſeeing I am ſo little able to demonſtrate my gratitude: but it is a matter of reputation for one to be in your eſteem, and I deſerved very little to have any ſhare in it, if I were ſo ungrate as not once to ſay, that I glory in having the honour to be ſomewhat conſidered by you. I muſt confeſs, that you are one of the perſons in the world I have the greateſt veneration for; that I never am with you, but it gives me a turn of thoughts, that are not ſo ordinary to me; and that I either feel myſelf the better by it, or am ſenſible, that it is my own fault I am not ſo. All I ſhall ſay then is, that I wiſh you a long life to be a good example and a bleſſing to this age; and that you may ſtill better your great character of being the beſt, the moſt knowing, the moſt charitable, and every way the moſt accompliſhed man of quality of the age, in which we live; for the longer you live, the greater you appear, which is not the uſual courſe of mankind. What I promiſed to ſatisfy your deſires in concerning this country ſhall be done with all poſſible diligence, for I would court any occaſion, by which I could demonſtrate the leaſt of that great deſire I have to be conſidered by you, as,

Right honourable,

your moſt obedient, and moſt

faithful affectionate ſervant,

PERTH.

WILL you forgive me, if I preſume in this paper to preſent my humble ſervice to my lady *Ranelagh*?

Mr. Joſeph Hill *to Mr.* Robert Boyle.

Rotterdam, April 20, 1685.

SIR,

IT is not ſo much the honour I have had of being a little, though but a little known to you, as your innate candour and ingenuity, that makes me preſume to trouble you with this addreſs. And ſo much the rather, becauſe I am well aſſured you will think yourſelf as happy in your acquaintance with this gentleman, as he is ambitious to be known to you, whoſe juſt character of merit is above his quality, though that is very ſufficient, being the eldeſt ſon of Monſieur *Saſburch*, the State's reſident theſe many years at *Bruſſels*, and brother-in-law to the king of *Denmark*'s envoy, Monſieur *Lent*, now reſiding with you at *London*. Being ſkilled in many ſeveral languages, and kinds of learning, as the French, Spaniſh, German, and Italian tongues, a great lover of chemiſtry, who, by your books, having known your great perfection therein, hath no ſmall ambition to wait upon you. And having never been in *England*, and knowing none here, that hath ſo much as ſeen you, requeſting this of me, I have rather preſumed upon your goodneſs, than deny him the writing of a few lines, that may lead him

him to you. If in any thing I can ſerve your honour here, in books or any other kind of ſervice, you may freely command him, who again deſires to beg your excuſe for this boldneſs, and always to approve himſelf,

Your honour's moſt humble,

and faithful ſervant,

JOSEPH HILL.

The earl of Winchelſea *to Mr.* R. Boyle.

Eaſtwell, Oct. 13, 1685.

SIR,

ONE Monſieur *Bouquet*, the bearer hereof, having ſuffered very much lately for his religion ſake, came hither to ſee a couſin of his, that ſerves me. He is eſteemed one of the greateſt chirurgeons in *France* for the king's evil, which he pretends to cure in ſix days, without leaving any ſcars. And he is eſteemed for an admirable receipt he hath for all agues without the Jeſuit's powder, which he cures in a few days; as alſo for all ſorts of cancers. If you pleaſe to ſee him and his atteſtations at your leiſure, I am of the opinion you will find him an able man; and if you give me encouragement, I will endeavour to ſet him up. He hath loſt to the value of ſeventy thouſand livres for his conſcience ſake, which is a great eſtate in *France*. I know you are willing always to do good, and therefore I recommend this poor man to you as far as he deſerves. He was fain with his ſons to run out of the back door of his houſe, as the dragoons came in at the other, and to walk on foot through *France* to *Ypres* in *Flanders*, and ſo to eſcape hither. I am ever

Your moſt humble, and

moſt faithful ſervant,

WINCHELSEA.

Dr. Guidott *to Mr.* Robert Boyle.

Bath, October 14, 1685.

Noble Sir,

HAVING under my hands, almoſt finiſhed, a diſcourſe in Latin, concerning the nature and virtues of the baths of *Bath*, and accidentally lighting on a ſmall diſcourſe of yours lately printed concerning the way of probation of mineral waters, in order to an experimental natural hiſtory of the ſame, I could not but give you my hearty thanks for the good ſervice you have done the publick, as well as the aſſiſtance I have particularly received in the ſubject I am upon, which, as I ſhall gratefully acknowledge, ſo may have an opportunity of communicating ſome other diſcoveries, that (perhaps) may not be unacceptable to your curioſity.

HOWEVER, finding many things there, that unexpectedly did confirm what I had written before, as well as ſuggeſt ſome things I had not attempted, I muſt, in this knowing age, come no nearer that child, that makes ignorance the mother of devotion, than to pay this grateful acknowledgment; or, in terms a little higher, leſs than divine adoration, to an unknown God, which, if it pleaſe, will be followed with greater ſacrifice.

IN the mean time, to treat ſo intelligent a being a perſon with his own viands, I crave leave to remind you, that you are pleaſed to ſay, you never yet met with a water predominately alcalizate. I ſuppoſe on good grounds I have aſſerted this to be ſo, though different from the ſentiments of all before me; to which I have been the more encouraged, in regard, beſides other arguments I have, with ſyrup of violets it turns very green.

I MUST likewiſe remind you what ſervice you have done in dethroning that uſurping opinion, that wherever a water turns with galls, there muſt be either iron or vitriol; in ſhort, that it is a certain ſign of acidity, when * ſulphur and alcalizate ſalts do the ſame; and a compoſition may be made, wherein undoubtedly nothing elſe is, that, on a mixture with galls, will preſently become of an inky complexion. To illuſtrate this, and confirm what you have firſt obſerved, a neighbour gentleman has now encouragement to dig for coal, a mile diſtant, where I waited on him, and found, among other things, that the workmen had lighted on a bed of marcaſites, ſome of which will ſhortly be at your ſervice. Theſe very much reſemble the pyrites, which I cauſed to be powdered and calcined with ſome alkalies, in which I obſerved ſo much brimſtone, that the ſubſtance itſelf could not be more convincing. A lixivium made of the calx, the filtered water with galls gave an inky colour in a minute, and the lee of the calcined powder without the ſalts a faint purple. The ſalts I put to the fireſtones were petre, common ſalt, and an alkali, called ſcendover. How near this comes to the aqua ſulphurata, you may pleaſe to conſider, as well as how much that aſſertion is confirmed, that an acid is not abſolutely requiſite in water to a purple colour with galls, which hereafter may, by my means, receive further illuſtration, who, with the tender of my hearty thanks, and humble ſervice, remain,

* If that be not acid, as the ſp. p. c. ſeems to atteſt.

Honoured Sir,

A great admirer

of your piety,

learning, and virtue,

P. GUIDOTT.

I SHALL ſhortly be in town, and then ſhall wait on you.

Mr. Thomas Brattle *to Mr.* Robert Boyle.

London, Dec. 18, 1685.

SIR,

THE underwritten is the copy of what I yeſterday read you out of Dr. *Avery*'s letter to me, dated in *Boſton, New-England*, December 5, 1684.

"THERE was a boy, called *John Symonds*, "ſervant to captain *Jacobs*, of *Hingham*, who, "when he was about ten or twelve years old, "was with a man at plough, and, as the man "was diſcourſing with ſome other perſons, ſat "down upon the ground before the oxen, "which, being affrighted, leaped over the "boy, and with the ploughſhare took hold "of the boy's ribs, and rent a hole in his "breaſt, at leaſt four fingers broad, on the left "ſide, ſo that Mr. *Joſiah Winſlow* and *Martha* "*Beedle*, a diſcreet woman, ſaid, that they "could ſee his heart, and the left lobe of his "lungs would fly out at the orifice, as he drew "his breath, two or three inches, when the "orifice was open, and did ſo work againſt "the pledget it was dreſſed with, that it "fretted off the ſkin, and made the lungs "very ſore. They were forced to turn him "to his left ſide, when they opened the ſore "to dreſs it, to pour out the watery and "bloody matter, that was gathered in his "breaſt; but his maſter told me, that they "could not ſee his heart after the firſt time "of dreſſing, and in ſeven or eight weeks "he became whole; and though that part "of the lungs, which uſed to ſlip or fly out, "did at laſt grow to the fleſh, and cloſe up "the orifice together, yet he felt no incon-"venience, but was well and ſound the laſt "year, at leaſt twelve years ſince the hurt "happened.

"THERE was alſo a child of one *Robert* "*Parkers*, of *Barnſtable*, that had a ſwelling "riſe upon the ſhin, a little below the knee; "the ſore broke, and continued about three "quarters of a year; then was the child about "one year and half old. Then they brought "it to *Hingham*, and in time they felt the "bone looſe at the upper end, and thought "to make inciſion, but found a hard callous: "then they took hold of the bone at the ori-"fice, and the whole ſhin bone came out as "far as the inſtep. There was a callous co-"vered the bone, like a caſe, or ſocket, "which now ſerves inſtead of a ſhin-bone, "only is ſomething bigger, as if the calf "were upon the ſhin, but is no impediment "to the child, who is nimble and ſtrong, and "now about ten years old." Thus far the letter.

SIR, enquiring of a maſter, that had been ſeveral times at *New-England*, he told me, the variation of the compaſs on St. *George*'s Banks, on the coaſt of *New-England*, is between ſeven and eight degrees eaſterly; and that at ſpring-tides the ſea in *Boſton* harbour riſes to about twelve foot; but hereof ſhall endeavour in time to give a more certain and exact account, who am,

SIR,

Your humble ſervant,

THOMAS BRATTLE.

Mr. Thomas Mackrith *to Mr.* Robert Boyle.

Hugly, February 5, 1685-6.

Honourable Sir,

WITHOUT being ungrateful, I cannot but acknowledge the honour I had of your acquaintance by Mr. *Glover*, immediately upon my departure, and the favours received from thence, in your inſtructions and directions to me in ſeverals relating to my voyage to and at *India*, which proved very uſeful and pleaſant to me in the ſaid paſſage, though my ſhort abode here has not as yet given me occaſion to improve the reſt to any advantage, but what occurred in my voyage (of which I kept a journal) I ſhall give your honour as particular an account, as my mean capacity will afford; and that,

FIRST, in relation to the ſaltneſs of waters, and the differences in ſeveral latitudes and places. The reaſons of the great quantity of ſalt in the ſame, and how it becomes ſo, I leave to the learned to explore; only ſhall give you what account I have had of it by relation, and my own experiments on the ſame. If I am not miſtaken, you told me, that ſalt water was generally $\frac{1}{44}$ part heavier than freſh; but I found it in all my experiments, that the ſalt water in ſeveral places was about $\frac{1}{32}$ or $\frac{1}{33}$ part heavier than *Thames* water, which probably may agree with what you told me, conſidering there may be that difference of ſaltneſs betwixt latitude 51 deg. in the *Downs*, which is much mingled with freſh rivers, and the places, where I took the other water up; which gives me much reaſon to be of a contrary opinion with captain *Wood*, who affirmed, that the nearer the pole, the ſalter the water; which I had occaſion to confute by experiments this voyage, as alſo by the credible relation of our third mate, who had uſed the *Newfoundland* trade all his days till now, and did aver, that the ſeas in thoſe parts, cloſe on board the ſhore, where they could find no ground, the water was only brackiſh, and not by many degrees ſo ſalt, as that near *England*, though he never was ſo curious to compare one with the other, by weight, or otherwiſe. The truth of this did ſeveral others on board affirm, whom I particularly enquired of.

BUT to the experiments, that I made in ſeveral latitudes, I give this account:

	grains
That having a vial of about half a pint, which I could fill exactly almoſt to a drop, in the ſame I weighed *Thames* water at St. *Jago*, 14 deg. N. lat. ☉ in ♍, and it weighed	3111
The ſame quantity of freſh water taken in at St. *Jago* weighed	3133
And the like quantity of ſalt water taken up there weighed	3204
Under the equinox, on Jan. 5, ☉ in ♒, the ſaid quantity of ſalt water weighed	3226
Under the tropick ♑, on Jan. 21. ☉ in ♐, the aforeſaid quantity weighed	3200
On March 10, ☉ entering ♈, in lat. 36 deg. S. a-breaſt of Cape *Bon. Sperance*, I weighed the aforeſaid quantity of ſalt water, and it was	3186
Returning again to the equinox, on April, ☉ in ♉, the ſame quantity weighed	3210
On April 24, ☉ in ♉, in lat. 10 deg. S. entering into the Bay of *Bengal*, I weighed the aforeſaid quantity of ſalt water, and it was	3206

Here I went down into the hole of the hold of the ſhip, and cauſed one of the bungs of the freſh water caſk to be opened, to which we no ſooner held a candle, but it took fire, and being deſirous to ſee, if it would burn, it ſinged ſome of our fingers, and gave fire to chips. I weighed this water in my uſual glaſs, and found it to weigh thirty five grains heavier than the ſame ſort of *Thames* water did at St. *Jago*, upon firſt coming out; the reaſon of which I am altogether ignorant of, only when we firſt opened the bung, there came out a ſteam, like a thick ſmoke, and it ſtunk.

FOR the more exactneſs in my weighing of all the aforeſaid waters, I brought a bottle of each out of every latitude aſhore, and weighed them over again (leſt the motion of the ſhip might have made ſome difference) and I did not find them to differ above two or three grains one with another; by all which I am convinced, that the chief cauſe of the ſaltneſs of the ſeas is from the ſun, and the nearer it, or the equinox, ſo much the ſalter, that is (excepting accidents of lands, *&c.*)

I HAVE preſumed to recommend to your acquaintance Mr. *Gualter Goddard*, now chief-mate of our ſhip, next voyage, I ſuppoſe, commander: he is a very ingenious gentleman, and curious in ſuch experiments, and has promiſed me to carry home for you a bottle of ſalt water, out of ſeveral latitudes, for your further ſatisfaction.

I HAVE ſaid nothing as yet of the difference of ſaltneſs of water on the ſurface and that at the bottom, which will be very hard ever to explode, though you have directed me the making of a very ingenious engine, for the bringing up of water out of any depth, which I exactly made, and found it would have done ſomething, that would have been curious, but that the happineſs of our voyage was ſuch, in a quick paſſage, that I could have no opportunity of a calm, to try it in; which was the ſame reaſon alſo, that I loſt ſeveral good experiments I intended to have made, by trying the power and preſſure of the water in ſeveral depths. But I have returned the engine with the ſaid Mr. *Goddard*, homeward bound, to ſee what may be done: but that engine wants not its own difficulties; for ſuppoſing it to be full of water, two hundred fathom down, and brought up within fifty fathom of the ſurface, ſhould then the ſaid box ſink again one foot, or leſs, it would evacuate all the water of two hundred fathom deep, and take in that of fifty; which will be a very hard matter to prevent, conſidering that the ſea at the calmeſt has always ſome motion or other on the ſhip or boat you are in.

As to the ſhining of the ſea, before or after ſtorms, and upon particular winds, I did narrowly obſerve the ſame throughout the voyage; but never could find any influence, that one wind had over the ſame more than another, either before or after ſtorms; for the ſea ſhineth at all times in the dark, when moved; though, I muſt confeſs, at ſome times more than at another, in which I could find no certainty; for having ſome ſalt water in a calm brought me into the dark, I moving the ſame with my hand, it ſhined extremely.

As for the magnetick vertue of the load-ſtone, and the variation of the compaſs ſometimes from that, I could make but little improvement in the knowledge of the reaſon thereof, though in my journal I kept an exact account of our daily variation, taken by the Azimuth compaſs, to give us ſome inſight into our longitude; but take theſe following obſervations: About lat. 10 deg. S. and 7 deg. merid. diſtance from St. *Jago*, we began to make a variation eaſterly, and run it up to 9 deg. 30 m. in lat. 28 deg. S. 10 deg. merid. diſtance from St. *Jago*; after which it falls away again to nothing in lat. 35 deg. S. and 31 merid. diſtance form St. *Jago*; where begins a weſterly variation, which runs up to 9 deg. on breaſt of *Cape Bon. Sperance*, and ſo on to 26 deg. variation in lat. 34 deg. S. and 32 deg. merid. diſtance E. from *Cape B. Sper.* and ſo it falls away again to 7 deg. and 6 deg. in the Bay of *Bengal*. The aforementioned Mr. *Goddard* told me, that being near the Iſle of St. *Laurence*, their needle went round all the points of the compaſs, and would ſtand no where; this not only in one, but in ſeveral compaſſes, which continued near the ſpace of a day; after which they traverſed again, as formerly. When we came into *Ballaſore* road, in the cod of the Bay of *Bengal*, I was an eye-witneſs to a ſhip, that came to anchor in a diſtreſſed condition, having met with a ſtorm at ſea, in which a clap of thunder broke upon her, and brought down her main and mizen-topmaſts, and ſhivered her main-maſt and one of her pumps, but no damage done to the hulk of the ſhip in the hold; but what was remarkable, at the ſame inſtant of the clap, the virtue of the needle of the compaſs in

the binnacle (by which they had ſteered that voyage) was altered, and it traverſed directly to the oppoſite points, and ſo continued, till that day that I ſaw it, and could not be put from it, but traverſed as true in oppoſite points, as any of the reſt, that were not thunderſtruck. It is ſtrange, and I thought worth your noticing.

NEXT followeth ſome particular paſſages, and obſervations taken out of my journal of the ſaid voyage; and firſt, concerning the weather, which proved very variable all the way till we came within 3 deg. N. of the equinoctial, about 6 deg. merid. diſtance from St. *Jago*, at which time and place (as we expected) there fell great rains and conſtant, accompanied with dreadful lightening generally all night, and continued ſo, till we were got 2 deg. S. of the line, which was a great while firſt, conſidering that we had little or no winds all the while, and ſultry hot weather, which is the occaſion ſometimes of great ſickneſs here. It is ſuppoſed, that about this place of the world it rains always, for I never heard of any, that did not meet with thoſe rains, let the ☉ be where it will; at this time ☉ was within a degree of ♍; and it is a common proverb amongſt ſeamen, "When we come at "the rains." If any clothes be wet with the ſaid rains, and lye ſo thirty ſix hours, there grows great numbers of large maggots immediately. This I have ſeen amongſt the poor ſeamen. And when we come on breaſt of the *Cape B. Sper.* eſpecially if we run up into 38 deg. or 39 deg. S. which oft-times ſhips are forced to do, to weather the cape; they are certain of very ſtormy weather: this is as conſtant as the other, and as much to be expected.

IN lat. 2 deg. N. I ſaw a ſpout, which being at ſome diſtance, I was not capable to make any obſervation on the ſame, but it appeared to be a ſucking ſpout.

IN lat. 31 deg. S. on Feb. 4, about ten o'clock at night, appeared a rainbow in the N. E. directly oppoſite to the monſoon. I have ſeveral times ſeen two rainbows at once of this form ☾☾; ſome affirm, that they have ſeen them thus)(; which I much doubt.

IN lat. 35 deg. S. on February 16, at two o'clock in the morning, the wind at S. I perceived a ſtar in the N. to ſhoot the length of three imaginary yards in the heavens, and left a large train behind it all that length, which continued viſible above a full minute by the glaſs, to the admiration of all that ſaw it.

I LIKEWISE did particularly obſerve thoſe commonly called the Magellanick clouds, which conſiſt of a greater and a leſſer; and are to my judgment compounded of a great number of ſmall inviſible ſtars, much of the nature of via lactea; they ſeem to be diſtance ten imaginary yards in the heavens, and have a due courſe, as other conſtellations; they both make one conſtellation (as I ſuppoſe) ſeeing they always appeared to me to be of one and the ſame diſtance; and conſtantly the leſſer followed the greater in riſing and ſetting. It was impoſſible to make any obſervation of them, for their right aſcenſion or declination, conſidering we were running through ſo many latitudes, and were not on terra firma.

ANOTHER thing I obſerved very ſtrange in the middle of the croſſiers, and now ſoutherly conſtellation: there, at ſundry times, as oft as the heavens were clear, appeared to me a very little, but extremely dark cloud, darker than any thing I have ſeen in the heavens; this I did ſuppoſe only to be a vacancy of ſmall ſtars, that were through all the reſt of the conſtellation.

THIS is all what offered worth the noticing in our paſſage to *India*, which we performed in 5½ months: for fiſhes and fowls, we ſaw none, but ſuch as are common to all who travel that way. As for the reſt of your articles of enquiry, I ſhall anſwer, as occaſion offers; and concerning a natural hiſtory of theſe parts, it will take up ſome time to be thoroughly informed of all the circumſtances of the ſame. But it is poſſible, that next year (if it pleaſe God) I may give you ſome general account of the ſame, ſeeing I already perceive, it will admit of great variety. Nought elſe, but that you would be pleaſed to command him, who is ambitious of ſerving you in any thing here, or elſewhere, and does unfeignedly reſt,

Honoured Sir,

Your honour's moſt humble ſervant,

THOMAS MACKRITH.

SIR, a medicine for the gravel in the kidneys would be very acceptable, I being oft troubled with it ſtill.

IN a calm the ſea ſtinks extremely; and if it had not pleaſed God to ſend a breeze, it had been very hurtful.

Newton, April 8, 1686.

SIR,

FIRST then I muſt tell you, I made my obſervation in my father's grounds, within two miles of *Newcaſtle* (though the like may be ſeen in many other places) in a pit near threeſcore yards deep, and the coal about five quarters high; the bottom, or hill (as we call it) of thoſe pits (as of moſt others) is a black ſlate-ſtone, not unlike ſome pieces of ſlate you may frequently meet with in ſome ſort of your common burning coal. As to the time, when the figures (I told you of) were firſt obſerved, I cannot reſolve you. For the eldeſt workmen I can meet with cannot give any account, when nature firſt began to paint after that manner. Neither will it be much more eaſy to tell you, in what time theſe figures come to their full perfection, our workmen not having been critical in the obſervance of it; but ſome ſay in a few months in the ſpring ſeaſon, others allot a longer time; ſo

that

that in this particular, I can give you no certainty. But I am informed the puncheons or prop-wood (as we term it) muſt be freſh, green cut, and placed in moiſture, and the bark on, if it ſend forth the figure of its own ſpecies upon the roof, which is ſo exact when it doth, that no pencil guided by the ſkilfullest artiſt can draw nature more to the life, colour only excepted. For that is whitiſh, inclinable to yellow or cream colour, not very unlike ſome ſort of painting, which I have ſeen in freſco, with dead colours. The branch, leaves, and every particular fibre are of the ſame, only diſtinguiſhed by ſhape, and the ſhades, which make the reſemblance of each part to nature itſelf in that exact proportion I have before deſcribed. This I am told may be ſeen in holly or birch, the only wood we uſe for props or puncheons in theſe parts; but from the latter only I ſaw this effect produced. The moiſture, which thus works out of the trunk, puncheon, or prop-wood, does not make any other impreſſion upon the ſtone, or ſlate, that is the roof of the coal (where it fixes itſelf in the form abovesaid) than paint upon ſome hard wood, or metal, before it be dry, and into which it cannot ſink, and may as eaſily be wiped off and defaced, as that I never heard of any part of the ſlate thus painted, brought above ground: the reaſon ſeems to be, becauſe ſuch prop-wood as produces this effect, being ſet for a ſtay or ſupport to ſome faulty or cracked part of the roof, or ſlate ſtone, it might endanger any workman, that ſhould attempt to take any part of it away.

THUS, Sir, I think I have made ſome return to every one of the queries, though not ſo diſtinctly and orderly as you propoſed them; I am ſure not ſo fully and particularly, as I could have wiſhed for your ſatisfaction. But that has not been altogether my fault, but the little exactneſs, with which thoſe (that converſe frequently under ground, and daily behold the wonders of that deep) obſerve them.

Mr. Leuwenhoek *to Mr.* Robert Boyle.

Auguſt 6, 1687.

Moſt noble Sir,

I MAKE bold to ſend you under cover theſe my ſmall obſervations, about which I alſo did write to the Royal Society. Firſt, becauſe I fancy they will be not unacceptable to your honour. Secondly, becauſe I know, that the Royal Society do not meet at this time.

I HAVE written four diſtinct letters to the Royal Society; and although I have not received any anſwer hitherto, yet I do not doubt but the ſame have been duly delivered.

To wit, one I did write on the fourth of April 1687, in which I treat about the ſtructure of the teeth.

ANOTHER on the ninth of May, in which I write about coffee: the third is of the thirteenth of June, in which I ſpeak of plants: a fourth is of the ſecond of July, in which I treat of procreation of ſilk worms.

I DO hope, that in theſe foregoing, as alſo in this preſent, ſomething may be found, which may pleaſe your honour, remaining in the mean while,

Moſt noble Sir,

your moſt humble ſervant,

&c.

Delft in *Holland*, Aug. 6, 1687.

To the noble lords, gentleman, and members of the Royal Society.

MY laſt was of the ſecond of July, which do not doubt but was duly delivered; at preſent, I ſend further ſome of my ſmall obſervations.

SOME have endeavoured over and above to perſuade me, that the klander and wolf do not procreate (the klander is a running vermin ſomething bigger than a full grown louſe) being two ſorts of vermin, that are often found in wheat and corn, and prove very prejudicial to the ſame, too well known by the corn merchants and bakers in theſe parts.

THE chiefeſt reaſons they did produce were theſe, that the wheat being lodged in a new granary, where never before any wheat had lain, the klander, notwithſtanding, in time would grow in it, which therefore happened without procreation.

SECONDLY, They alledge, that much wheat is found, which as to the outſide is ſo entire, that not the leaſt hole or opening can be perceived; yet when you come to open it, you ſhall meet with a full grown and living klander. I did endeavour to convince them to the contrary, by alledging, that the workmen may probably, and without their knowledge, carry along with them from an infected granary, either the grains infected, or the vermin itſelf ſticking to his clothes, ſtockings, or ſhoes, and ſo infect a granary, where before none of this vermin was found.

THE ſame may be alledged of any ſhip, waggon, or cart, which formerly has been made uſe of for the tranſportation of grains. I further deſired, that the firſt klanders, that could be procured (it being in the midſt of winter) might be ſent to me. On the 13th of March 1687, I obtained ſome wheat, of which ſome grains were made hollow, and others filled and intermixed with this klander.

I TOOK three divers glaſſes, and in them I put ſix, eight, and nine clanders, and eight, ten, and twelve grains of ſound wheat as near as I could judge, having purpoſely kept the ſame in a box.

IN a fourth glaſs I put ſome klanders without any wheat, but this I found would not

do, the klanders dying after the twelfth day. Now by reaſon of the cold finding theſe animals moſt part of the time without motion, I did carry the glaſſes about me in my pocket, I had no other thoughts but clearly to convince, that the klander was produced from a worm, and for that purpoſe I often viewed the klander through the microſcope, but the excrements of the klander, which copiouſly did ſtick to the glaſs very much, prejudiced my obſervation. The figure of theſe excrements was long and taper; thoſe as were ſhorter had the figure of an egg, and were alſo tranſparent. I had ſome thoughts, that the klanders did not eat like unto thoſe flying creatures of the ſilk-worm, and ſome of the caterpillars; but I found to the contrary, to wit, that the klander devours corn, and makes a ſound grain of wheat entirely hollow, and lodges himſelf within it; and that with their ſnout (which is lodged at the fore part of their heads) and which is very long in proportion of their body, they do bore through the hulls of the wheat, and that by the help of little tools in the form of teeth, with which the ſnout is provided at its end.

FOURTEEN days after, being the 27th of March, I ſaw that ſome of the klanders were cloſed by copulation one with another; and that they did ſtick cloſe together a great while, the female carrying the male, running thus along with him; and alſo I did often toſs and tumble them, yet they remained cloſely united. After this I opened ſome of the klanders to take out their eggs, but I could not fully ſatisfy myſelf with any certainty. After this I went to ſearch the maſculin ſeed of the klander, and I collected of it about the bigneſs of a big grain of ſand together, and I placed it to the eye through a very good and much magnifying microſcope, and diſcovered a prodigious great number of living animals in this ſmall parcel of matter, inſomuch that it would ſeem incredible to thoſe, who have not ſeen it themſelves. I am perſuaded no general ſurveying two armies conſiſting of 50,000 men, and fully enaged, could obſerve ſuch manifold motions in them, as I did ſee in this ſmall parcel of the maſculin ſeed, and that ſo long until my eyes were tired. I laſtly did kill theſe little animals, becauſe among theſe great and various motions I could diſcern nothing but their heads, or upper part of their bodies. Theſe little animals being dead, and thus lying aſunder, I ſaw with admiration their long and ſlender bodies, being ſome of them ſomewhat more bulky towards the upper part of their bodies further, as often as I had occaſion. I viewed theſe klanders that were ſhut up in the glaſs, and obſerved them all couple, but no life in them till the 10th of June, as when I ſpied among the klander and wheat two ſhort, thick, and ſmall worms, one about the bigneſs of a big grain of ſand, the other four times as big. Whereupon I opened the glaſs, in which ſix klanders had been ſhut up, and alſo did examine the grains of wheat, that had lain all the while amongſt them, of which two I found that were empty. Out of another grain, which as to the outſide appeared leaſt of all waſted, but notwithſtanding had many little holes, which with the bare eye could not be diſcerned, I took out a full grown klander, which had a fair red colour, but thoſe as were old, and had been ſhut up for about three months together, were of a dark brown red, and to the eye blackiſh. In another grain of wheat I ſaw a klander, which was very white, lying with his legs, horns, and ſnout in ſo proper an order, that I fancied to behold a ſilk-worm ſo far changed, as to be ſpeedily turned into a flying animal, only with this difference, that this white and imperfect klander was not wrapped about with a ſkin or huſk, as the ſilk-worm. Out of another grain of wheat I took a ſhort thick worm about the length of a klander, ſo that I judge, that theſe worms in few days would aſſume the form of klanders. I went further to open other glaſſes, and took out of a grain of wheat a klander, which did begin to change his white into a red colour: this was conſtantly moving his poſteriors. I took alſo out of other grains worms of different bigneſs: my deſign was to cut open the klander, which thus long had been ſhut up; but whereas at that time ſome gentleman came to ſee me, it happened, that at the interim theſe klanders made their eſcape. I alſo obſerved, that klanders do lay ſo ſtill in a cold ſeaſon, that one cannot perceive the leaſt motion in them. But to find out the living among the dead, I breathed upon them, and ſo the living began to move. Now I had ſtill a fourth glaſs, in which I had ſhut up eight klanders, and fourteen grains of wheat, which I alſo had carried about me in my pocket; ſome of theſe grains had little holes, and three others half ſpent. I did open all theſe grains, but could not diſcern any living creature, or any eggs in them. I did open three or four of theſe klanders, and took out their bowels, and found, that two were females, for out of one of them I took out five perfect white eggs, which I fancied to have their full growth; out of the reſt I took more: after that I opened ſeveral other klanders, and diſcovered in them a complete ovarium, ſome eggs having their full bigneſs, others gradually were leſſer: by this I concluded, that as the flying moth of the ſilk-worm, within the ſpace of two or three days, lays many eggs, and after that ſuddenly dies, that to the contrary the klanders lay but few or one egg a day, and that, for that reaſon, the klander remains a life ſo long, that they might multiply proportionally to the ſilk-worm and other creatures; for the klanders, of which I ſpeak, have been alive ever ſince laſt ſummer.

Mr. John Love *to Mr.* Robert Boyle.

Torbeby, near *Michaelſtown* in *Ireland*, Feb. 21, 1687.

SIR,

MY lord of *Orrery*, your brother, for the laſt ſeven years of his life, gave me

bread, together with the benefit of hearing his real wiſdom, which conſiſted only in the conſequence of his lordſhip's having employed that number of years in the duties of religion. His lordſhip did often in that time expreſs a concern for a body of reformed Chriſtians in *Piedmont*, whoſe piety he much admired. A little before his death he ſpoke much of them, quoting monſieur *Aubigné*, whom he commanded me to endeavour to tranſlate, at leaſt that part, that related to thoſe Chriſtians; but before I did any thing in it, God was pleaſed to take my lord to his eternal mercy.

THE impreſſion his lordſhip's commands left on me, has ever ſince forced my enquiring into their circumſtances, of which, by the means of one Mr. *Francis Quaile*, a worthy clergyman (who going with my lord *Kingſton* into *France*, met with a complete hiſtory of them) I have fully informed myſelf.

I HAVE for five or ſix years paſt expected its publication in *Engliſh*, Mr. *Quaile* and I both in all that time concluding a thing ſo neceſſary in the church could not be untranſlated; but finding, by my frequent converſe with clergymen (who, through God's mercy, are in this kingdom both very good and very numerous; a bleſſing our predeceſſors here could not boaſt of) that none had yet diſcovered his undertaking to inform our countrymen, I did employ thoſe hours of the laſt winter, my country labours would allow, in epitomiſing and tranſlating that hiſtory into *Engliſh*.

I HAVE, for ſeveral months paſt, expoſed it to the cenſures of ſuch prelates, and other clergymen, as well of the church of *England*, as nonconformiſts, as I could come near, whoſe general objection is, that the epitome is not ſatisfactory to learned men, though it may be of great uſe to others. I do now therefore, by the bleſſing of God, reſolve upon tranſlating the whole, for the ſatisfaction of ſome, and edification of others.

BUT here I ſeem to queſtion, wherefore I, who never had the honour of being known to you, ſhould in this caſe preſume to addreſs. I confeſs I do but ſeem, for in reality I cannot doubt your forwarding any work, that tends to the glory of God, and the good of thoſe creatures he has bleſſed with rational and immortal ſouls. Your late care of the ſouls of the ungrateful natives of this iſland (had there been no other evidences) is ſufficient to encourage this preſumption.

I AM ſenſible it were impertinence to trouble you (who cannot be a ſtranger to the original) with an Engliſh compendium of the book, or to ſay more on that point, than that it is monſieur *Jean Leger*'s general hiſtory of the (Vaudois or) Waldenſes, printed at *Leyden*, anno domini 1669, which I have endeavoured to tranſlate out of French into Engliſh. I do not hear of more than three of the books in this kingdom, but am well aſſured, were there but one of them in *England*, it could not be unſeen by you.

THE ſubſtance of my moſt humble requeſt to you is, that you will command your ſervant to put your ſtationer upon enquiry, whether any ſuch tranſlation is either licenſed, or propoſed to be printed in *London*. But the chief and only end of this my preſumption is, that I may have the honour of your opinion, whether, or no, monſieur *Leger* in Engliſh may be of uſe in the reformed church of Chriſt in theſe kingdoms; which if you pleaſe to vouchſafe, my ſiſter will take care to ſend it to

Your honour's
moſt humble and
moſt obedient ſervant,
JOHN LOVE.

Mr. Ellys *to Mr.* Robert Boyle.

Caius College, in *Cambridge*, Oct. 26, 1688.

SIR,

ACCORDING to Mr. *Henry Wharton*'s direction, *Maimonides*'s *More Nevochim*, waits upon you with this. I am ſorry, I could procure for you no other edition. Of the Arabick original I cannot hear at all. The Hebrew tranſlation, with a comment, all in that tongue, in folio, belongs to *Emanuel* College Library; and of that perhaps I might obtain the uſe for you, if you pleaſe to deſire it, on my giving ſecurity for its reſtitution ſafe and entire. My beſt ſervices, Sir, are moſt freely at your command; for however unknown I have hitherto been to you, the moſt hearty veneration, which I have for ſuch a benefactor to all men, but to the ſtudious more eſpecially, will always inſpire me with deſires, as far as poſſible, to approve myſelf,

SIR,

Your moſt faithful ſervant,
and true honourer,
Jo. ELLYS.

I MUST add, by Mr. *Wharton*'s order, that this book coſt me ſix ſhillings.

Mr. Joſiah Woodward *to Mr.* Robert Boyle.

Cooperſale, May 16,

SIR,

IN obedience to your pleaſure, of having a full account of the maid's caſe, who vomited the ſtone, which I lately left in your hands, I here humbly preſent you with a brief relation of it, which I take from her own mouth.

SHE is now about forty five years of age, very crooked, and ſhort; and being unable to get a livelihood by labour, was taken in charity by the lady *Archer*, about eleven years ſince,

ſince, to weed the gardens. About nine years before ſhe vomited the ſtone, ſhe was knocked by a blow on her head, given her by her paſſionate brother with his fiſt, which occaſioned the firſt fit, that ſhe was obſerved to have; after which, every ſudden fright caſt her into the like; into which ſhe uſually ſunk ſilently, and lay on her back or ſide, without ſtruggling or foaming. She could perceive ſomething riſe up in her throat, which ſtopped her breath, and ſo ſhe fell. The malady encreaſed by duration. Her fits came more and more frequently, and continued longer, without any fright or apparent occaſion. Sometimes the fit continued an hour, and after a little raiſing of herſelf on her knees, ſhe fell into another. About two years before ſhe vomited the ſtone, ſhe perceived ſomething like a little bean (as ſhe often told me) riſe up into her throat. About this time ſhe had ſometimes ſix or ſeven fits in a day, ſometimes falling into them in her bed, and being very ſick after them, was inclined to vomit, till at laſt ſhe vomited blood ſeveral times, yet the ſtone remained: at length vomiting blood, ſhe brought the ſtone into her mouth, and made ſhift to ſpeak to a ſervant near her to take it, who inſtantly brought it to me; which is now about ſix years ago, after which ſhe was exempted from her fits, but now of late ſhe ſays a ſudden fright makes her ſwoon away, but nothing ſo bad as her former fits. She tells me, that, about a year before ſhe vomited this ſtone, ſhe vomited ſomething of the ſame ſize and figure of the ſtone now in your hands, but of a bloody colour, and not ſo perfect a ſtone, yet very hard, which ſhe threw into a baſket of weeds, and ſo loſt it. But ſhe had but little (though ſome) eaſe by the diſgorging of it.

THIS, Sir, is the moſt perfect ſtate of her caſe that I can give: which, though a wonder to my ſhallow capacity, may probably be eaſily ſolvable to your great judgment, which has made ſo many ſecrets of nature loſe their name.

MAY it pleaſe Almighty God to preſerve your life and health, as a common bleſſing to the world, to which his infinite goodneſs has made you a general benefactor, and at laſt crown all your virtuous and elaborate ſtudies in the bleſſed ſtate of perfect piety and knowledge. In which wiſh I am ſure the learned and ſenſible part of the world will concur with,

SIR,

Your moſt humble ſervant,

JOSIAH WOODWARD.

AN

APPENDIX

To the firſt part of the

CHRISTIAN VIRTUOSO.

* * * *

A FOURTH advantage the virtuoſo has above other perſons, is, that when he is once convinced of the truth of the Chriſtian religion, he is better qualified than other men to adhere ſtrictly to it, in ſpite of the ſophiſtry and other oppoſitions of its adverſaries, whoſe grand objections are theſe four.

I. THAT the hiſtorical part of the ſcripture contains the relation of ſome things incredible; I mean, the miracles, and ſome promiſes of things impoſſible to be accompliſhed.

II. THAT the doctrinal part delivers pretended myſteries, that are not to be comprehended.

III. THAT the proofs alledged in behalf of the Chriſtian religion are not demonſtrative, but on the contrary.

IV. THAT divers things, whoſe belief is enjoined by the Chriſtian religion, are repugnant to the principles, or the dictates of philoſophy.

AN anſwer to which objections is contained in the following dialogues, or conferences.

CONFERENCE I.

Juſtinus. TIME is a thing ſo precious, and ſo uſeful, that it were pity we ſhould miſpend much of the little, that is allotted for this day's meeting, upon the needleſs ceremonies, that too ordinarily do more than begin the conferences of gentlemen. And therefore, with your leave, I ſhall take the freedom to decline preambles, and haſten to put you in mind, that, according to the method of our debates, the things, that we are this evening to conſider, are ſome of the chief objections, urged by *Authades*, againſt the Chriſtian religion.

Euſebius. I ſo well like your deſign of huſbanding time, that, in compliance with it, I ſhall rather follow your example, than the dictates of cuſtomary civility: and, preſuming, that theſe gentlemen, who have too well improved time, not to have a great value for it, will not diſavow me, I ſhall deſire you to name, without delay, the firſt objection, that is couched in the liſt, of thoſe I preſume you have ſet down, in the paper I ſee in your hand.

Juſtin. IN obedience to your order, I ſhall acquaint you, that it is this: "That there "are in the new teſtament divers ſtrange "things, there called miracles, recorded; "that are impoſſible to be done: and divers "promiſes, menaces, and other things, de"livered, as from God, of which it may "juſtly be ſaid, that it is incredible they can "ever be made good."

Eleutherius. I DO not wonder, that *Authades* ſhould lay much ſtreſs upon the objection; ſince one can ſcarcely have a ſtronger motive to deny his aſſent to a hiſtory, than that the thing related is impoſſible; or to refuſe his reliance on a promiſe, than that it is not poſſible to be made good.

Argument I. *Juſtin.* I SHALL not now examine, whether theſe allegations be abſolutely and unreſervedly true. But that they are not rightly applied to the relations and promiſes of the Goſpel, I ſhall endeavour to manifeſt, by the enſuing reflections.

AND firſt, I conſider, that poſſible, credible, and their contraries, are not abſolute, but relative, or reſpective things; and conſequently, that, to determine ſafely of them, we muſt conſider as well the power of the agent, as the nature of the thing recorded to have been done, or the effect promiſed to be produced. If it be related, that a whale, or an elephant, did fly for an hour together in the air, that action aſcribed to ſuch agents may well be judged phyſically impoſſible, and conſequently incredible. But if the ſame action be aſcribed to an eagle, or faulcon, every one will confeſs it may be true. So if a boy had been recorded to have wielded a ſpear, "whoſe ſtaff was "like a weaver's beam," and furniſhed with "an iron head, that weighed ſix hundred "ſheckles" (that is above ſixteen or ſeventeen pounds) the narrative had been incredible. But when this ſtupendous force is attributed to a giant, as *Goliah* is ſaid to have done, who wore a coat of mail, weighing near about "an hundred and fifty pounds of braſs," ſo weighty a weapon will not be judged incredibly diſproportionate to ſo great and ſtrong a champion. Thus alſo, if an American fiſherman, that is acquainted but with a canoe, ſhould undertake, that the ſun ſhould be eclipſed on ſuch a day ſeven years after, and that he will ſteer a veſſel into this or that part of *France*, or *England*, his promiſes would be very unfit to be relied on, as being made by an illiterate fellow, unfurniſhed with abilities to make them good. But if the ſame things ſhould be undertaken, though in the ſame ſpace of time, by an European pilot, ſkilled in aſtronomy, and the art of navigation, it would be no credulity, to think, that he may perform his promiſes. You will eaſily believe, Gentlemen, that it were not difficult to add many inſtances, in confirmation of thoſe, that I have named.

1 Samuel, xvii. 7.

Euſebius. I READILY grant it, *Juſtinus*, and therefore deſire you to proceed.

Juſtinus. I SHOULD preſently do it, *Euſebius*, but that I think it requiſite to premiſe, that I hope you forget not, that in our preſent conference, *it is ſuppoſed, that the hiſtorical* part of the Goſpel is recommended to us by the authority of ſuch witneſſes, as are abundantly ſufficient, in the capacity of witneſſes; that is, that their teſtimony would be without exception, if they bore witneſs only to things, that were (in their own nature) poſſible and credible. Argument II.

Manlius. AUTHADES himſelf would not, I preſume, deny your ſuppoſition, in the equitable and cautious terms, wherein you have expreſſed it. And, indeed, divers learned men, that have written in behalf of the Chriſtian religion, have ſufficiently made out, that the evangeliſts, and other writers of the new teſtament, were ſincere men, that delivered bonâ fide to poſterity the things they believed, they ſaw and heard. But then *Authades* will ſay, that the perſonal qualifications of the witneſſes ought not to inforce an aſſent to narratives repugnant to the poſſibility of things: and that therefore, though the witneſſes may deſerve to be believed on all other occaſions, yet no human teſtimony can oblige us to believe things incredible; as all things muſt be, that are impoſſible.

Juſtinus. WHAT you propoſe, *Manlius*, as the plea of *Authades*, is, I confeſs, very ſpecious. For I readily acknowledge, that the miracles and divers promiſes recorded in the new teſtament, might ſome of them be judged impoſſible, and others not credible, if they were related as paſſages of a natural or civil hiſtory; ſuch as thoſe of *Pliny*, *Tacitus*, *Thucydides*, or the like. But then we are here to conſider, that both in the ſtupendous matters of fact recorded, and in the future events, predicted by way of promiſe, or menace, a divine agent is introduced, as interpoſing his uncontrolable power and unſearchable wiſdom. And therefore we are not to pronounce the matters of fact impoſſible, or incredible, unleſs we can make it appear, that they ſurpaſs

the power of God himself, as well as that of other agents. And as for him, not only the
Matt. xix. 26. Luke i. 37. scripture witnesseth, that Christ said, "that "with God all things are possible;" and an angel pronounces, "that with God nothing "is impossible;" but the very notion of a Being infinitely perfect, which seems to be the best idea we are able to frame of God, includes omnipotency, that is, as great and unlimited a power, as it is possible for any being to possess. And accordingly, divers of the Heathen philosophers and others were led, by the light of nature, to acknowledge in the Deity so immense a power, that one of them sticks not to say,

——*Finemque potentia cœli,*
Non habet, & quicquid superi voluere, peractum est.

To which purpose, another, speaking almost in a scripture phrase, thus expresses his mind:

Esse Deum si noris, & hoc tibi scire necesse est,
Nil non posse Deum.

And *Virgil* gives God the very title the Christian creed attributes to him, where he says,

Tum pater omnipotens, &c. Virg. Georg. lib. II.

Eleuth. I think your distinction, *Justinus*, to be both well grounded and pertinent; and it may be authorised by a clause of that text
Matt. xix. 26. you lately cited out of the Gospel. For when the disciples asked their divine master a question, which implied an objection, he answered the ground of it, by saying, that, though to the mere power of man, the thing in question was impossible, yet it was not so to God, since to him all things are possible. And the apostle *Paul* seems to have had his eye upon this distinction, when he said to
Acts xxvi. 8. king *Agrippa*, "Why should it be thought "a thing incredible with you, that God "should raise the dead?" intimating, by naming the Almighty Agent, that it was a sufficient reason, why so difficult an article, as the resurrection of the dead, ought not to be judged incredible, by those, that believed its having been revealed, or by (otherwise) most credible testimony affirmed, or brought to pass
Ver. 27. by God; as he declares, he knew that king *Agrippa* did.

Euseb. I think this discourse of the apostle *Paul* to be no way repugnant to right reason. For he supposes the miracles he speaks of to be granted, as having been so recent and notorious; and that what the prophets delivered in the holy scriptures, was grounded on such arguments, of the same kind, and other collateral proofs, as deservedly made their authority acknowledged by *Agrippa*. So that the veracity, power, and wisdom of God were concerned to verify the truth of the resurrection. Which things being supposed, I shall not scruple to add, for confirming and compleating the argument proposed by *Eleutherius*, that it is extremely difficult for us dim-sighted mortals, to discern the utmost extent of the divine power and knowledge; and that it is therefore unfit and unsafe for us to determine it negatively.

Just. You are much in the right, *Eusebius*; for power, as we now consider it, is a relative thing, not only in reference to the effects to be produced by it, but in reference to the faculty, that is to take measure, or make an estimate of it. And in such cases as we are speaking of, I think we may look upon knowledge, or wisdom itself, as a kind of power; since a man is justly reputed able to do, not only what he can perform by his strength, or force, properly so called, but also what he can bring to pass by means of his knowledge, skill, or wisdom, guiding and regulating his force. Thus, as has been already noted, there are many things, that surpass the power of one agent, that yet are easily performed by another; nay perhaps by the same, when its potency increases. And on the other side, we plainly see, that the estimates, that are made by ignorant judges, of the power of agents of higher orders, are much too scant and derogatory. A child, that can build a house of cards, will not conceive, how an architect can build such a structure as the capitol, or *Nebuchadnezzar*'s palace; nor can he imagine, how a man can, without stirring out of his chamber, *&c.* * * * * *

But we need not descend so low as children, for instances fit for our present purpose, since even amongst men of ripe years, though of the same species, and perhaps of natural capacities very little differing, that power, which accrues to man through knowledge, enables some Europeans to do such things, as the savages of the American islands (to say nothing of thousands of country people nearer home) looked upon as to be beyond the power of men; and therefore, when they saw some, even of the least difficult sort, of those things, performed by the Spaniards, that first came among them, they took them to be beings of an order superior to men, and worshiped them as Gods. And without travelling so far as the savage and ignorant inhabitants of America, how few are they (besides those few, that are acquainted with the mathematicks) that can conceive, how an astronomer can measure the distance between the earth and the moon, or the sun; and how he can, many years before, know to an hour the time of an eclipse of the sun or moon? An inferior degree of which skill the learned and inquisitive Greeks themselves were strangers to, till *Thales*, the first of their seven wise-men, to their general admiration, gave an instance of it.

Euseb. You may, *Justinus*, add to these queries, how one, that is no gnomonist, though otherwise, perhaps, no ignorant man, but a learned one, can so skilfully place a piece of wire upon a board, as to oblige the sun, who is computed to be remote from it [21600 semidiameters of the earth, or 86051398 English miles, according to modern astronomers,] to give him an account, as often as he shines forth, of his motions and his gesses, his distance from the horizon, and many other things? and how, which is yet a more difficult question,

[See *Derham*'s Astron. Theolog.]

on, a man that never was near, or perhaps within a thouſand leagues of, the country he was to go to (nor, perchance, ever was at ſea before) ſhould be able to ſteer a ſhip through the vaſt ocean, to a determinate port, poſſibly in the *Eaſt*, or in the *Weſt-Indies*, that is not a quarter of a league broad.

Juſt. YOUR inſtances, *Euſebius*, are pertinent, and ſhould be backed with many others, if I did not think, that thoſe, that have been named already, may allow me to make this
Argument III. application of them: that ſince one man can ſo little make eſtimates of what another, who himſelf is but a man, can perform; we pur-blind mortals, that are not of the higheſt order of God's creatures, may juſtly think ourſelves but incompetent judges of the extent of the power and knowledge of God, that is, of a being, that is eſſentially as perfect, as it is poſſible that any being ſhould be, and conſequently, whoſe power may juſtly be ſuppoſed to reach farther, than our limited intellects can apprehend, or for that reaſon, without a ſaucy raſhneſs, can preſume to bound.

Euſeb. THAT what you come from ſaying, *Juſtinus*, is rational, may perhaps be made appear ſo the better to *Torquatus*, if it be repreſented to him, that, though it be true, what ſome of his philoſophical friends believe, that in the idea of a being infinitely perfect, all poſſible excellencies, and conſequently an immenſe power and knowledge, are included; yet it is alſo true, that as to us, they are ſo contained there, that we men have but general and confuſed notions of them, and are not wont to eſtimate their extent, but according to the productions of them, that we obſerve. And experience ſhews thoſe, that are attentive to it, that the moſt enlarged and affecting notions we have of the divine attributes, flow not from the ſimple idea we have of God, but from the conſideration of thoſe works and actings of his, wherein he has diſplayed thoſe attributes, and from the greater or leſſer capacity of our intellects, to diſcover and apprehend them. And for my part, the bare knowledge of this truth, that it is eſſential to God, to be perfectly powerful, wiſe, and beneficent, would never have given me ſuch enlarged conceptions of his excellencies, as the effects of his power, in producing of his wiſdom, in framing and governing the world, and of his goodneſs, in ſo richly providing for the temporal welfare and eternal happineſs of men, have juſtly produced in me. And ſince, as *Juſtinus* has lately well obſerved, men, that are eminently knowing and ſkilful, may perform things, that unſkilful men would judge unfeaſible, I think it may well be ſuppoſed, that angels, who are of a higher order than men, may, by their intellectual advantages, have a far more reaching proſpect of the extent of the divine power and knowledge, than we pur-blind mortals have: which, being granted, will diſcover more and more preſumption in them, that adventure, upon the authority of their narrow notices, to circumſcribe God's omnipotence, and his omniſcience. * * * * *

Manlius. BUT can you really think, *Juſtinus*, that there ought to be no limits placed to the divine power; and that there are not any things, that God himſelf cannot do? Argument IV.

Juſt. THOUGH I be much of the mind of a great perſon, that thought it more fit and reſpectful to ſay, that ſuch or ſuch things cannot be done, than that God cannot do them; yet I do not deny, that ſome things, that men may call bounds, may be aſſigned to the divine power. But then I allow theſe boundaries (if they may be properly ſo called) to be no others, than ſuch as cannot but be admitted, unleſs we will teach what is manifeſtly repugnant to the nature either of things, or of God.

Man. I SHALL be glad to learn from you the explication and the grounds of your aſſertion.

Juſt. THERE are ſome notions and propoſitions, that are therefore impoſſible to be true, becauſe they are repugnant, I ſay, not to the changes of the textures, or other modifications of things, but to their eſſential ideas, if I may ſo call them. As for inſtance, that a ſphere of ſilver ſhould be turned into a ſphere of gold, is a thing, which though extremely difficult to be performed, yet doth not appear to be impoſſible abſolutely ſpeaking; becauſe a merely mechanical change of the texture and other modifications of the ſmall parts that compoſe the metal, may ſuffice for ſuch a change. And ſo a ſphere of ice may, by being thawed in a bullet-mold, be reduced into ſuch a fluid body, as is a ſphere of water. But that there can be made a cylindrical ſphere of gold is impoſſible, becauſe the eſſential ideas of thoſe two bodies are evidently incompatible: and to give gold the neceſſary properties of a cylinder, the matter to be transformed muſt neceſſarily loſe thoſe of a ſphere; and to make a ſpherical cylinder is as impoſſible, as to make an odd number, that may be divided into two even whole numbers, or to make a ſquare triangle, the ideas of the ſubject and the attribute being manifeſtly inconſiſtent.

Eleu. GIVE me leave to add, gentlemen, that beſides ſuch notions as theſe, wherein the incompatibility of the ſubject and the attribute is manifeſt upon the firſt attentive view of them; there are other repugnancies to the nature of things, that are not ſo obvious, and therefore require, beſides attention, ſome diſcourſe to diſcover them, at leaſt to others, if not to a man's ſelf; the irreconcileable diſagreement of their ideas needing now and then ſome little ratiocination to be diſcerned, or to be declared. * * *

I PROCEED now to an argument, which, Argument V.
though in ſome ſenſe ſubordinate to the former, will not only ſtrengthen it, but perhaps will by itſelf make a more powerful impreſſion than it, on many, if not moſt, perſons, as it is a ſenſible proof, and grounded on matters of fact. For there were divers wonders actually performed in favour of the Chriſtian religion, by the firſt promulgers of it, and by ſome of the prophets, that of old

made predictions, that may bear witneſs to the ſame religion, which recorded wonders already performed ſeem as incredible, as divers of thoſe ſtrange and unlikely events, ſome foretold, and others promiſing the Goſpel, can juſtly be pretended to be, which upon that account our infidels object againſt as altogether unfit to be believed.

THE evangelical hiſtory records divers things relating either to God's power or his knowledge, that ſeem plainly ſupernatural, and are undoubtedly ſtupendous, upon the ſcore either of the nature of the thing performed, or of the manner or circumſtances of the performance. Jeſus Chriſt is recorded to have healed the ſick, cured the lame, reſtored ſight to the blind (though born ſo) cleanſed the lepers, and in ſhort to have cured all manner of diſeaſes and ſickneſſes among the people; and (which is much more than all that) to have raiſed the dead. And this he did without proper means, by his bare will, ſometimes expreſſed by words, as when he ſaid to the leper, "I will, be thou clean;" and when he told the centurion, "Go thy "way, and as thou haſt believed, ſo be it "done unto thee;" upon which his ſervant (who was then abſent) was immediately made whole: and when he ſaid to a dead man, "Lazarus come forth:" and ſometimes by means not only inſufficient, but according to human eſtimate, contrary to the effect to be produced, as when he healed the blind man with clay and ſpittle: and to ſuch inſtances of his power over men, we may add others of that he exerciſed, or that was exerciſed on his account over other beings. Thus he made the ſea not to yield under his feet, when he walked on it himſelf, and made *Peter* for a while to do ſo: he blaſted the fig-tree by his curſe: he drew, without natural means, multitudes of fiſhes, to a place they would not come to before: and by rebuking the tempeſtuous winds and ſwelling ſea, he ſuddenly calmed them both: he in a trice turned common water into choice wine at a feaſt: and more than once ſo feaſted ſome thouſands of people with a very few loaves and ſmall fiſhes, that the fragments amounted to much more than the victuals did before he multiplied them. On his account there was ſuch an earthquake near *Jeruſalem*, as rent the rocks, in which his body was laid. In the air loud voices were heard, which in articulate words bare witneſs to him. And there appeared a new ſtar, refulgent and elevated enough to draw the admiration of the eaſtern ſages, and engage them to make a long voyage to *Jeruſalem*. And in the heavens his birth was celebrated by a celeſtial hoſt; and his death ſignalized by an eclipſe of the ſun, when the moon was at full. Nor was it only over inanimate creatures, that Chriſt's power was exerciſed, but alſo over beings of a higher order. For when he was tempted in the wilderneſs, good angels miniſtred to him; and as for the bad ones, he often ejected them in ſpite of their reluctancy: he reſtrained them from ſpeaking, when he thought not fit to permit it: and even when numbers of them had poſſeſſed one unhappy perſon, he forcibly diſlodged them; as when out of *Mary Magdalen* he caſt ſeven devils; and out of a frantic man ſo many, that their crowd made them take upon them the name of Legion; which when expelled, were not able to enter ſo much as into a hog; though when they had his permiſſion, they were able to hurry a herd of two thouſand ſwine into the ſea. Nor were the effects of Chriſt's knowledge leſs ſtupendous than thoſe of his power. For he declared what was done in places he was not near; as when he told *Nathaniel* of his being under the fig-tree. He declared things paſt, which he had no human means to know; as when he told the Samaritan woman, (to omit other particulars which ſhe owned to her neighbours, he had declared to her) that ſhe had had ſo many huſbands, and lived now with one as her huſband, that was not ſo. He diſcerned the thoughts of men's hearts; and foretold ſuch contingencies, as that ſuch a particular diſciple of his own ſhould betray him; and that the Jews and Gentiles ſhould conſpire his death, and make it ſuch an one as was not threatned by the Jewiſh laws. He foretold the deſtruction of *Jeruſalem*, and divers forerunners and other circumſtances of it. He foretold the particular manner of *Peter*'s death; and that when he had caſt his angle into the ſea, a fiſh ſhould bite at it, which ſhould have ſuch a determinate piece of money in its mouth: which puts me in mind to add one circumſtance of ſome of his predictions, which in my opinion doth wonderfully argue the greatneſs of his preſcience, as well as of the divine power. For he foretold ſeveral things, that not only ſeemed to be very contingent, but were in themſelves miraculous, and therefore could not have been produced by the courſe of human affairs, or by chance, as it is pretended of divers other things foretold by aſtrologers and Heathen oracles. For a mere, though ſtrangely lucky, concourſe of natural cauſes and accidents, might poſſibly produce the propoſed effect. But ſuch effects as were beyond the power of natural cauſes, could not be foreſeen in them: ſuch as were his own reſurrection, the gift of tongues, and of curing diſeaſes without medicines; and, which is more, of ejecting devils, *&c.* which being effects ſupernatural, could not be foreſeen, but by the help of one, that was alſo able, by a ſupernatural power, to produce them: and therefore the Heathen aſtrologers and renderers of oracles wiſely forbore to venture on ſuch predictions. * * * * *

Euſeb. SOME of the arguments you have employed, and the very way of reaſoning you have made uſe of, will be very acceptable to ſome virtuoſi, that you and I are acquainted with; who think, that though ſuch as they are liable to ſome particular temptations to be infidels, yet that inconvenience is more than compenſated, by ſome peculiar advantages they have, towards believing the wonders, and expecting the promiſes, delivered in the Goſpel.

Mark i. 41, 42. Matt. viii. 13. John xi. 43. John ix. 6, 7. Matt. xiv. 25, 29. Matt. xxi. 19. John xxi. 6. Matt. viii. 26. John ii. 8, 9, 10. Matt. xiv. 17, 18, 19, 20, 21. xv. 3, 4, 5, 6, 7, 8. Matt. xxviii, 2. Matt. iii. 17. John xii. 28. Matt. ii. 1, 2. Luke ii. 13, 14. xxiii. 44, 45. Matt. iv. 11. Luke iv. 41. Luke viii. 2. Mark v. 2, 3, &c. John i. 48. John iv. 18. John xiii. 26. Mark x. 33, 34. Luk. xxiv. 7. Mat. xxiv. Mark xiii. Luke xxi. John xxi. 18, 19. Matt. xvii. 27.

Argument VI.

Eleuch. For my part, I do not wonder, that the gentlemen you ſpeak of ſhould be of that mind; for in my opinion, a virtuoſo, that knows how to put nature to her plunges, and can ſkilfully reduce her to ſhew her ſubtilty and power, muſt oftentimes ſee ſuch things performed by her, as make him think the vulgar catalogue of impoſſible or incredible things to be far greater than it ought to be; he being aſcertained, by trials and obſervations, that ſhe is more powerful and ſubtil in her operations, than any thing but experience would perſuade men. And yet all the admirable productions and phænomena of nature, being but the effects and reſults of local motion, and two or three other mechanical affections of the ſmall parts of the univerſal matter, acting on one another according to ſettled laws; it were unreaſonable to deny, that the grand author of nature, who freely, or arbitrarily eſtabliſhed thoſe laws, may, either by ſuſpending, or altering them, or by a more immediate guidance of the motions of the minute parts, or greater portions of matter, or by ways as unknown to us, as thoſe, by which he, being an incorporeal ſubſtance, can give motion to matter: a virtuoſo, I ſay, that knows and conſiders theſe things, will eaſily grant, that this divine agent may, by divers ways, ſome of them imaginable by us, and others inconceivable to us, bring ſuch things to paſs, as the ordinary courſe of nature would never produce, and ſurpaſſing thoſe, which her unaſſiſted power could ever reach to. * * * * *

Much more ſhould be ſaid to confirm what has been ſaid, if I were not afraid it would appear a digreſſion; and therefore I ſhall now only add, that the obſervation of the various, and oftentimes admirable contrivances, and ſurpriſing fetches, whereby ſome created agents, or ſecond cauſes, are able to purſue their ends, and bring very unlikely things to paſs, does prepare the heedful naturaliſt to believe, that the divine and omniſcient author of nature may exerciſe, when he thinks fit, a far more manifold and admirable wiſdom, and, if I may ſo ſpeak, ſkill, in the compaſſing of whatever he deſigns to effect or bring about. And therefore, if our experimentarian be once ſatisfied, that God has declared, that he will do ſuch a thing, or that it ſhall come to paſs, he will make no doubt, but that God will be able to make good his word.

As for the firſt of theſe objections then he will be kept from being much ſtaggered by it, by the conſideration of thoſe ſupernatural experiments, commonly called miracles, that are recorded in the new teſtament, and were not only atteſted by moſt faithful eye-witneſſes, but were ſo real and conſpicuous, that many of them were done before the enemies of the religion, they bore witneſs to; and turned many of thoſe enemies into proſelytes. Now theſe miracles being not to be done, but by a power, that was able to controul the courſe of nature, or ſurpaſs her power; thoſe ſupernatural phænomena are not only ſeals to atteſt the doctrine to be from God, but ſuch inſtances of his power, as contained ſufficient grounds to believe him able to perform what that doctrine engaged its hearers to expect. And whether or no it may be abſolutely affirmed, that neither the promiſes, nor the menaces of the Goſpel, oblige us to believe more incredible things, than the miracles that confirmed it, ſhew the author of it able to perform; yet at leaſt it may be ſaid, that what he has done is more ſtrange, than divers of thoſe things, that infidels would have it impoſſible, that he ſhould do. * * * *

In anſwer to the firſt objection it was conſidered,

1. That poſſible, credible, and their contraries, are not abſolute, but relative or reſpective things, and conſequently, that to determine ſafely of them, we muſt conſider, as well the power of the agent, as the nature of the thing recorded to have been done, or the effect promiſed to be produced.

2. That the hiſtorical part of the Goſpel is juſtly ſuppoſed to have for it the authority of witneſſes, abundantly ſufficient in the capacity of witneſſes.

3. That indeed the miracles, *&c.* recorded in the new teſtament would not ſome of them be poſſible, nor the reſt credible, unleſs aſcribed to the power of God, but to that they are not impoſſible.

4. That it is very difficult for us dimſighted mortals to diſcern the extent of the divine power and knowledge, and therefore unfit and unſafe to determine it negatively.

5. [That the matters of fact recorded in the new teſtament do make the belief of its miracles and traditions juſtifiable.]

6. That a virtuoſo has a peculiar diſpoſition to believe, that things incredible to others may be poſſible, and that promiſes and menaces very unlikely may be made good.

To theſe things is added an anſwer to the ſurmiſe, that a virtuoſo is inclined to refer all ſtrange things to nature and art.

Occasional Thoughts

Belonging to the preceding conference, intended by the noble author to have been inſerted in their proper places, had he completed it.

Though matter can do nothing in reference to matter, but variouſly move it, or ſtop or determine its motion, yet it will not follow, that an immaterial ſubſtance can do no more; and what it can do, muſt not be eſtimated merely by the effects of one body or portion of matter upon another; as the human ſoul can determine the motions of the human body, and by its union with the body (which union depends on God's arbitrary conſtitution) it can receive impreſſions from the body; ſo that by the divine appointment a ſoul and a body have each of them a power tranſcending that which belongs to it, on the account of its

its own nature; and consequently, it is like, that he, that gave them that power, may have a far greater.

Deists must, to maintain their negative creed, swallow greater improbablilities, than Christians, to maintain the positive creed of the apostles. And they must think it fitter to believe, that chance, or nature, or superstition, should perform wonderful and hardly credible things, than that the great author of nature, God, should be able to do so.

CONFERENCE II.

Justinus. I PRESUME, gentlemen, you have not forgot, that at our last meeting, we went no farther than the Examen of the first of *Authades*'s four objections: and therefore we shall now, if you think fit, proceed to the second, and without further ceremony call upon his and our friends *Manlius* for it.

Manlius. I shall not make you wait for it, gentlemen, but propose it thus. That the choice of a man's religion being the most important action of his life, he ought not to make it upon a less firm ground than a manifest demonstration of the truth of that, which he choses: and yet the Christian religion does not afford, or scarce dares pretend to any clear demonstrative proof of its truth, or however cannot evidence it, as may appear by this, that it is gain-sayed and disbelieved by a far greater part of mankind, than that which embraces it.

I do not wonder, that we find not all the prime articles of our religion as clear as common notions, nor the conclusions, by which they are proved, as cogent as mathematical demonstrations. For, in my apprehensions, God, who meant, that men's faith and obedience should be, though not meritorious, yet rewardable virtues, thought fit to propose the Christian religion in such a way as may rationally satisfy honest, though prudent persons, without necessarily convincing vicious and obstinate cavillers; giving light enough to those, that are willing to walk by it in his paths, without taking away their misused liberty from those, that are resolved to shut their eyes against it; as the star, that appeared at the author of Christianity's birth, guided the wise men, that are willing to follow its directions, but could do no service to the priests and Pharisees. In short, I think the Gospel was designed to be accompanied with an evidence, that should be sufficient, without being irresistible.

To the second objection it was answered.

1. That since all things are not capable of being demonstrated, it is not just to require other proofs of a thing, than such, as, in case it be true, the nature of it will bear.

2. That if this consideration be allowable in matters physical or moral, it ought to take place much more, when the things treated of, are of a sublime, abstruse, and supernatural order.

3. That perhaps several points of the Christian religion would be found capable of higher proofs, than are usually urged for them, even by divines, if the Christian cause were skilfully managed.

4. That besides the nature of the things themselves, it is to be considered, that the design of the Christian religion ought to keep the truths from being incontestible, because God would keep faith a rewardable virtue.

5. That when a thing proposed to our assent is not merely speculative, but an object of choice, about which we are obliged to determine some one way, then we are not chiefly to consider, whether the proposition be convincingly proved, but whether it have great advantage of the opposite, since that, which is not sufficient to make a man sure that he chooses the truth, may yet be sufficient to satisfy him, that he makes a prudent choice.

6. That the plain truths of the Gospel are as plainly proveable, as, the premises considered, it is necessary (or perhaps fit) that they should be.

OCCASIONAL THOUGHTS.

There are some bad men, that, though very studious, may be compared to those flies, that seem very fond of courting the light, that shines in the flame of a candle, but striking it with their wings, they do things, that really tend to the extinguishing of it, but with such ill success, that instead of destroying the flame, themselves, or at least their wings, are destroyed by it.

Most things are not so demonstrable to most men, but that arguments may be framed, as well to impugn or question, as to evince them: so that if a man have a strong aversion from such or such a truth, or a great proneness to embrace the contrary error, his corrupt affections may prevail to make his intellect afford so much attention to all the proofs, that favour an error, and may so take him off from sufficiently attending to the arguments, that shew it to be an error, or that manifest the opinion, that opposeth it to be true, that his undertakings thus biassed may really for the time assent to the error, and reject the truth, though when the mind comes to be *sui juris* again, it cannot rest in an erroneous assent, but must at length close with and submit to a light, that it cannot always resist.

Some admirable mysteries of religion are in vain sought by those, that endeavour to find them, that they may debase or prevent them to mean or vicious purposes: as the angels, notwithstanding their distinguishing loveliness, could not be discovered by all the endeavours of the Sodomites, that sought for them to abuse them.

CONFERENCE III.

Argument I. *Juſtinus.* AFTER what has been ſaid, gentlemen, before our late receſs, to *Authades*'s ſecond objection, I preſume you will allow me, without ſpending more time upon that, to paſs on to his third; which I ſhall therefore in your name, and with your permiſſion, deſire *Manlius* to propoſe.

Manlius. I SHALL do it in a few words, *Juſtinus*, by telling you, that, according to him, the doctrinal part of the Chriſtian religion delivers pretended myſteries, that are not to be comprehended: which aſſertion, if it be true, cannot but amount to a very ſtrong, if not inſuperable, objection. For ſince aſſent, which comprehends faith, is an act of the human intellect, *Authades*, think it not reaſonable, that men ſhould believe any thing, which is not intelligible to the aſſenting faculty, and conſequently cannot be rationally believed by it.

Juſtinus. I SHOULD be very little acquainted with the great propenſion, that our ſelf-love and imperfections give us, to flatter ourſelves, if I did not acknowledge the objection newly urged very like to be thought conſiderable by moſt, to whom it ſhall be propoſed. But there are ſeveral things, that keep me from thinking the argument unanſwerable.

AND firſt it may be conſidered, that our underſtandings are but dim-ſighted, and our knowledge very perfect, even when they are converſant but about natural things.

Eleu. I AM apt, *Juſtinus*, to think, that thoſe, who ſhall deny what you have aſſerted, have not made much trial of their ſkill upon difficult ſubjects. For though I dare not eſtimate the ſucceſs of others in ſuch attempts, by the diſcouraging one, that I have met with in thoſe I have ventured to make; yet by the frequent confeſſions and complaints even of excellent writers, when their modeſty is not much inferior to their learning; I find, that the beſt philoſophers have upon full trials been made ſenſible, that the darkneſs of many things is too thick to be diſcuſſed by the dim light of their reaſon * * * * *

OCCASIONAL THOUGHTS.

As much as we pride ourſelves in our underſtanding, we may daily obſerve, that the actions and performances of a ſenſeleſs grain of corn for inſtance, or of a kernel of an apple, ſurpaſs our comprehenſion.

IT is no wonder we ſhould be nonpluſſed by the creatures of God's making, or by his ſupernatural revelations, when we are nonpluſſed even by creatures of our own making, and propoſitions of our own deviſing, ſuch as are the aſymptotes of the *Hyperbola*, the *Linea Nicomedis*, &c.

Argument II. *Juſtinus.* WHEN I ſhall have advanced a little further, gentlemen, it will not be difficult to perceive, that what has been diſcourſed in the firſt argument, may well be judged to have made way for the ſecond, the latter being little more than an application of the former. My next conſideration therefore ſhall be this; that if there be ſcarce ſurmountable difficulties in the conception of things corporeal, it ought not to be denied, that there may be greater in the conception of things ſpiritual and ſupernatural.

Eleuther. THOUGH what you ſay, *Juſtinus*, appears very probable in itſelf, yet it contains ſomething of that importance, that it may deſerve to be eſtabliſhed by a few arguments (and many it will not need).

Juſtinus. I AM much of your mind, *Eleutherius*, in both the things contained in what you come from ſaying: and therefore, as on the one ſide I ſhall propoſe a couple of arguments to confirm my lately mentioned conſideration, ſo I ſhall confine myſelf to that ſmall number too; whereof the firſt ſhall be drawn from the conſideration of the abſtruſe nature of divers articles of religion; and the other from that of the depravedneſs of men. As for the firſt of theſe, there are certain natural imperfections, that belong to men as ſuch, or at leaſt to the generality of men, on whoſe account their faculties, eſpecially as men uſually employ them, are diſproportionate to divers notions and propoſitions, that belong to theology, either natural or revealed. In the mention I juſt now made of our diſcerning faculties, I purpoſely ſaid, as men uſually employ them, becauſe I have obſerved, that the cauſe of divers of the miſtakes and others, that alienate many otherwiſe ingenious men from aſſenting to ſome ſublime theological truths, and from ſo much as hoping to underſtand them, is, that they unſkilfully confound two faculties, that, as they are very different, ſo ſhould be very carefully diſtinguiſhed, and miſemploy imagination, to conceive ſuch things, as are the proper objects of the pure intellect. But ſince it is like there will be occaſion to ſay more of this hereafter, I ſhall now proceed in what I intended to ſay about the indiſpoſition, that moſt men have, to underſtand things, that fall not under the ſenſes, nor do appear explicable by mechanical principles. This thoſe, that have exerciſed themſelves in reſearches about the more ſublime or abſtruſe kinds of ſubjects, cannot but be ſenſible of: and even abſtracting from thoſe theological notions and dogms, that the ſchools have borrowed from Chriſtianity, and interwoven with their metaphyſicks, the merely philoſophical part of that ſcience obliges the critical ſtudiers of it to take notice of ſeveral beings, and perhaps ſeveral orders of them, that differ from the whole variety of bodies conſidered as bodies. In the more accurate metaphyſicks, we may take notice of the great difference there is between ſtable and permanent beings, ſuch as have what is eſſential to them all at once, and ſucceſſive ones, as local motion, flames, ſtreams, and divers other things, which being in a continual flux, enjoy their beings but as it were by parcels, being never two minutes

the ſame. There we may alſo take notice of privations, negations, extrinſical denominations, *entia rationis* (if theſe be not, as ſome will have them, of a generical nature, compriſing the three others) not to name any other metaphyſical entities; in diſcourſing about which we are often obliged to make uſe of peculiar ratiocinations.

Eleuther. Give me leave, *Juſtinus*, to add a couple of entities, that though we do not owe to metaphyſical ſpeculations, required to be diſcourſed of in a peculiar way, becauſe of their peculiar nature. Perhaps I need not tell you, that theſe are place and time, to which we cannot ſafely apply ſeveral of thoſe ratiocinations, that hold good in bodies, and ſome of them in ſome other beings too. And yet time and place, though they exceedingly differ from each other, has each of them properties ſo peculiar, that the famous *Gaſſendus*, and divers other learned men, will not only have them to differ from all the works of nature, but to be antecedent to them; and to be of ſo anomalous an order, and of ſuch vaſt extent, that all the ten predicaments cannot compriſe them; and they are properly neither ſubſtances nor accidents, having been antecedent to the firſt formation of the univerſe; ſo that the world itſelf may be ſaid to be but accidental to time and place, which would retain their own natures, though God ſhould think fit to annihilate all the productions of the ſix days creation.

Juſtinus. Without entering into the Examen of the learned *Gaſſendus*'s particular ſentiments, I think one may ſay, that it is manifeſt enough to conſiderers, that in mentioning time and place, you have ſupplied me with a couple of heteroclite beings, that may be pertinently alledged to my preſent purpoſe. And therefore I ſhall now proceed to ſpeak of ſpirits, intelligences, or, as they are more uſually called, good and bad angels, which are confeſſedly of an order widely differing from bodies, and ſuperior to them, how curiouſly ſoever they are contrived, and how nobly ſoever they be qualified.

Now as to this kind of beings, one, that reads the numerous queſtions and determinations of them, that ſeveral metaphyſical writers and ſchool-divines have delivered, even about niceties and particular circumſtances relating to ſpirits more properly ſo called, would indeed think, that men, who deſcend to ſuch minute particularities, had clear and penetrating notions of at leaſt the eſſential nature, and the principal attributes of ſpirits. But yet though I will not ſay, that theſe things were to the mental eyes of theſe writers, almoſt as inviſible as the ſpirits themſelves were to their bodily ones; yet I ſhall venture to own to you, gentlemen, that I think, that of theſe abſtracted objects their knowledge was, and ours is, very dim and imperfect; and that we might eaſily diſcover it to be ſo, if we would employ about theſe ſubjects ſuch an attention, as their ſublime nature, and the properties, that diſtinguiſh them from bodies, require. Men are wont to think, that they have ſufficiently declared the nature of a ſpirit, by defining it an immaterial ſubſtance. But this is but a negative definition, which tells you indeed, that it is not corporeal, but gives you no poſitive idea of ſo much as the principal attributes of the thing. It teaches ſomething, but nothing near enough: and a man, that knows, that a ſpirit is not a body, may be as little able to form to himſelf an adequate or ſatisfying idea of an intelligence, a good angel, or a demon, as he that only knows, that a crooked line is not a ſtrait one, can give himſelf a rational account of the peculiar and ſtrange differences and affections of particular curves, ſuch as make the ellipſis, the hyperbola, the parabola, and others.

Euſebius. He, that conſiders what the holy ſcriptures deliver about angels, good and bad, and their actions and performances, will find, that thoſe ſpirits are ſubjects of ſpeculation little leſs abſtruſe than they are ſublime.

Juſtinus. You are much in the right, *Euſebius*; for a man, that will give himſelf the leiſure and trouble of making an attentive inſpection into ſuch difficult ſubjects, as the nature, properties and operations of immaterial ſpirits, and will not acquieſce, but in clear conceptions of them, will find the difficulties of framing ſuch conceptions ſcarce ſuperable by his intellect itſelf, and altogether inſuperable by his imagination. For ſince that faculty, which is called fantaſy or imagination, is a corporeal faculty, and is exerciſed but about ſuch things, as were introduced into the mind by the ſenſes, or are compounded of ſuch images, or derived from them; how can thoſe, that will employ but their imagination, frame a conception of an immaterial ſpirit, which not being a corporeal ſubſtance, cannot be conveyed by the ſenſes to the fantaſy, nor truly repreſented by a corporeal image? But if the very nature of a ſpirit be not truly imaginable, how little will they be able to conceive divers properties, that belong to it, and the manner how divers of its actions are performed, whilſt they employ but their imagination to frame their conceptions? And even when we ſpeak of men in general, without confining ourſelves to the over-valuers of imagination, it is very difficult for a man to conceive, how an angel, or a demon, being an incorporeal ſubſtance, can declare his thoughts to another angel? How he can, out of the air, or ſome other as inviſible body, frame to himſelf, at pleaſure, ſomewhat, that is ſo like a human body, that it has often been not ſo much as ſuſpected to be any thing elſe? How he can make this aſſumed body appear and diſappear at pleaſure? How, whilſt he is in ſome manner ſcarce explicable by us men united to it, he can move from place to place, and ſpeak, and deſcend, like a body devoid of gravity, and put this body into a flame, without being injured by it, as happened in the caſe of the angel, that appeared to *Manoah?* How he can perform things, that require ſo much power, as an angel exerciſed, when in one night he deſtroyed about 180000 ſoldiers in the Aſſyrian camp;

and Satan, when God permitted him, diſplayed in the great fire, that fell from heaven, and conſumed *Job*'s cattle, and thoſe that kept and guarded them; and the prodigious ſtorm, that overthrew the houſe, where all his children were feaſting, and buried them in its ruins?

Euſebius. THOUGH theſe are unaccountable things, that you have mentioned, about angels and demons, yet the ſcripture delivers many others, either by way of hiſtory, or dogmatically, that are diſproportionate to our diſcerning faculties. And if we ſhould but take notice of the many paſſages, that are to be met with in the book of *Daniel*, and in the Apocalypſe, that ſpeak wonderful things of angels, it would abundantly evince what *Juſtinus* has aſſerted.

Eleuther. YOU may, I think, ſave yourſelf that trouble, *Euſebius*, ſince thoſe, that read the ſcriptures with any kind of attention, and make reflections on the paſſages, that ſpeak of angels and their operations, will eaſily find their faculties diſtreſſed by ſuch inexplicable things. And therefore, though *Torquatus* admitting the authority of the holy ſcripture, it was allowable for *Juſtinus* and *Euſebius* to make uſe of the paſſages in it, that relate to angels good and bad; yet perhaps it will be more proper, to conſider a little that order of beings we call ſpirits, as it has been acknowledged by Heathen philoſophers, inſtructed only by the light of natural reaſon. And becauſe *Ariſtotle* may be juſtly looked upon as a philoſopher, that whatever he do in his exoteric, or more popular writings, does, at leaſt in his acroamatic or accurate ones, aſcribe almoſt all to nature, and very little to God, as an agent diſtinct from her; I wave the mention of the opinions of the Platoniſts and Pythagoreans, who were much more inquiſitive than he into the nature and kinds of ſpirits, and have treated more diſtinctly of them: I ſhall only take notice of ſome things, that *Ariſtotle* himſelf teaches about them. For you know he admits inviſible beings, that he calls intelligences, which he makes to be ſeparated from matter, and to be the movers of the celeſtial orbs. And if he did indeed acknowledge one ſupreme God, as moſt of his interpreters, and ſome other learned men, maintain he did, I ſhall take the liberty to add, to the intelligences, that moved the planets, a ſort of rational beings, that he ſeems to place above them, and indeed beyond the utmoſt limits of the world. *Demonſtratum eſt*, ſays he, referring to the precedent diſcourſe, *extra cœlum nec eſſe corpus, nec etiam eſſe poſſe. Patet ergo* (he continues) *neque locum extra cœlum eſſe, neque vacuum, neque tempus.* To which perplexing paſſage he ſubjoins an inference, which he ſeems to me to apply plainly enough to a kind of beings, differing, at leaſt in order and nobleneſs, from ſuch intelligences as his followers are wont to mean, when they ſpeak of the Ariſtotelian ſpirits. For theſe are mundane intelligences (if I may ſo call them for diſtinction ſake,) whoſe conſtant, and, for ought appears, only work it is, inceſſantly to move the celeſtial orbs; whereas thoſe ultra-mundane intelligences, or rather divine ſpirits, of which I am going to give you his words, are above the higheſt heaven, and are not buſied in keeping bodies in motion. *Quocirca* (which word ſhews the connexion of the following inference with the words above recited out of him) *neque apta ſunt ea, quæ illic ſunt, eſſe in loco, neque tempus ſeneſcere ipſa facit, neque ullius eorum ulla eſt mutatio, quæ ſuper extima diſpoſita ſunt latione: ſed nullis alterationibus, nullis paſſionibus prorſus ſubjecta optimam in univerſa ſempiternitate vitam & ſufficientiſſimam habent.*

Ariſt. de Cœlo, L. 1. c. 10.

AND now, I ſuppoſe, you will allow, that I might obſerve, that by his way of mentioning the newly named ultra-mundane beings, *Ariſtotle* ſufficiently intimates, that there are ſubſtances, which ſhould be diſcourſed of, in a particular way, that is not required, when we diſcourſe of the other beings of the univerſe; eſpecially ſince he not only makes them unchangable, but will not allow them to be ſo much as ſubject to time. But without too far preſſing theſe difficulties, I ſhall repreſent to you, that partly concerning celeſtial intelligences, and partly about his ſuperceleſtial ſpirits, *Ariſtotle* delivered ſuch things, as are no leſs difficult to be conceived, than almoſt any of the myſterious articles of religion, that *Torquatus* reproaches as incredible, on the account of their being inconceptible.

Manlius. I SHALL be glad to hear your reaſons for this aſſertion.

Eleuth. I WAS juſt going to ſubjoin ſome of the principal of them.

AND firſt, ſince theſe intelligences are ſeparate beings, and on this account immaterial, as on the former rational, all the puzzling difficulties, that attend the notion of an incorporeal and intelligent ſpirit, as ſuch, muſt be accounted for by him, that will maintain *Ariſtotle*'s doctrine. And how great and perplexing theſe difficulties are, eſpecially to thoſe that think we can underſtand but what we can imagine, has partly been intimated already, and may, if it be required, be farther ſhewn.

ANOTHER of theſe difficulties is afforded by the conſideration of what I am next to mention. For *Ariſtotle* will have his intelligences to be the movers of the celeſtial orbs. But how an immaterial ſubſtance, that is, one that has no parts, wherewith it can lay hold on or touch a body, and either impel or draw it, can ſet it a moving, and keep it for many ages in a conſtant and regular, though ſtupendouſly rapid, motion, is a thing, that I fear will long remain unconceivable, at leaſt to thoſe, that expect to have clear ideas and proofs of what they are to acquieſce in. Not to add to this difficulty, that of believing, that a ſingle intelligence ſhould have ſo ſtupendous a power, as to move with an amazing ſwiftneſs ſo vaſt an orb, as that, for inſtance, of Saturn; which orb may be I know not how many millions of times bigger than the terraqueous globe, to which we uſually give the title of world.

If it were not to be too boldly inquiſitive, I would gladly demand; whether theſe intelligences had any origin or not? and if they had, when, and from whom they had it? For ſince *Ariſtotle* will have the univerſe, and conſequently the heavens, to be eternal, and the celeſtial orbs to be moved from weſt to eaſt, but by theſe intelligences, theſe ſpirits muſt have been eternal too: and if ſo, they ſeem to be ſelf-exiſtent beings; and being alſo immortal, intelligent, and of vaſt power, what ſhould hinder, but that *Ariſtotle*, and thoſe that eſpouſe his ſentiments, muſt look on them as ſo many gods? And then not only polytheiſm muſt be allowed, but all the difficulties, how inſuperable ſoever, that have been, or may be objected againſt the plurality of gods, muſt be ſurmounted; and an account muſt be given, by whom an eternal, wiſe, and powerful ſpirit, could have limits placed to its excellencies? And why it ſhould be confined to a province, like that of the conduct of a ſingle orb, and to do nothing in this orb it ſelf, but to keep it in a conſtant and unvaried motion? But if it be ſaid, that theſe intelligences were not ſelf-exiſtent beings, they muſt have been created by a higher being; and how ſo noble a ſubſtance as an intelligence, which far ſurpaſſes in excellency the nobleſt parts of all the corporeal univerſe, can be produced out of nothing, what proof ſoever may be brought for it, who can conceive?

In the third place, not to mention, that *Ariſtotle* will not allow, that without the viſible heavens there is either place or vacuum, (though how both theſe together can be excluded, is ſomewhat difficult to conceive,) I obſerve, that he will have it, that his ultramundane ſpirits are not in any place; which prerogative belonging to them upon the account of their being immaterial ſpirits, ought not to be denied to thoſe intelligences, that move the orbs, and conſequently the planets, which being ſometimes above the earth, and ſometimes beneath it, and having very differing aſpects, as trine, quadrate, oppoſition, *&c.* in reference to one another, either the ſpirits muſt move together with the planets they keep a moving, and ſo be ſometimes in one place, and ſometimes in another, which argues them ſubject to locality; or elſe they muſt move the celeſtial bodies, without being preſent with them, and operate where they are not; which, how they ſhould be capable of doing, he that is able to conceive, may, if he ſet his mind to it, find leſs obſcurity in divers of the myſteries of religion. * * * *

Juſt. I doubt not, *Eleutherius*, but you can make further reflections, on the difficulties, that are involved in this doctrine of *Ariſtotle*, concerning intelligences celeſtial or divine. But perhaps our friend *Manlius* may be eaſier convinced of the abſtruſe nature and actions of immaterial ſpirits, if we give him an inſtance of it in that rank or order of theſe beings, that is generally looked upon as not the moſt ſublime, and which we have the greateſt opportunities to be well acquainted with.

Eluther. I shall need to expreſs my approbation of the expedient you propoſe, only by deſiring you, as I earneſtly do, to enlarge upon it.

Juſt. Encouraged then by ſo favourable a permiſſion, I ſhall repreſent to *Manlius* two things. The firſt is, that, as you juſt now truly hinted, the rational ſoul or human mind is, of all the incorporeal ſubſtances, that which we have the means, as well as intereſt, to know the beſt; ſince it is not only a familiar object, but ſo intimate, as to be the nobleſt part of ourſelves; and that the chief, not to ſay the only thing, that is eſſential to it, and in a ſound ſenſe conſtitutes its nature, is, that it is conſcious to its own actions and operations, and that, at leaſt for the moſt part, not as it knows the circulation of the blood in the veins, or the ſecretion of gall in the liver, by a ratiocination upon ſenſible phænomena, but immediately by an internal ſenſe or perception.

And to this firſt I ſhall add my ſecond reflection, whoſe nature makes it require a longer diſcourſe; that, notwithſtanding theſe great and peculiar advantages, we have for the knowledge of the faculties and operations of our own minds, yet the human ſoul is a myſtery even to herſelf, and in the ſpeculation of it, ſhe is eaſily able to diſcover difficulties, which ſhe is very little able to clear. * * * *

OCCASIONAL THOUGHTS.

When I ſay, that a ſpirit is incorporeal ſubſtance, he that I ſpeak to needs not employ (nor indeed properly can employ) his imagination, to form the notion or idea I would excite in his mind. And if he ſhould anſwer, that when he hears the words incorporeal ſubſtance, he imagines ſome aerial or other very thin ſubtil and tranſparent body, I ſhall reply, that this comes from a vicious cuſtom he has brought himſelf to, of imagining ſomething whenever he will conceive any thing, though of a nature uncapable of being truly repreſented by any image in the fancy. But if I ſhall add, that a ſpirit is a ſubſtance indiviſible, the portion of air or æther, by which he lately endeavoured to repreſent to himſelf a ſpirit, will be altogether improper; ſince neither the air, nor any other body, can be imagined without extenſion, and therefore without diviſibility (actual or mental); and conſequently this phantaſm, whatever it be, cannot (in ſound philoſophy) be a true notion or idea of a ſpirit, which is (or as it is) a ſubſtance indiviſible into parts. [Whether there be any neceſſity that a corporeal idea, or an image drawn on the fancy, ſhould intervene to frame the conception, when we ſay, *ex nihilo nihil fit?*]

Because the uſe of imagining, whenever we would conceive things, is ſo ſtubborn an impediment to the free actings of the mind, in caſes that require pure intellection; it will be very uſeful, if not neceſſary, to accuſtom ourſelves not to be ſtartled or frighted with every thing, that exceeds, or confounds, the imagina-

imagination; but by degrees to train up the mind (if I may ſo ſpeak) to conſider notions, that ſurpaſs the imagination, and yet are demonſtrable by reaſon. Thus, though we can ſcarce repreſent to ourſelves the ſun much bigger than he is wont to appear to our eyes, yet aſtronomy compels us to have a quite other idea of its magnitude, by ſhewing us, that it many times exceeds that of the whole earth. And ſo, when looking upon the ſide and diagonal of a ſquare, we are wont to imagine it an eaſy thing, to aſſign ſome known meaſure, that being ſo many times taken, will exactly meaſure both thoſe lines, and ſhew their rational proportion: and yet a mind accuſtomed to geometrical demonſtrations will be convinced, that among a million of different quantities, no one, that can adequately meaſure the ſhorter of theſe two lines, will likewiſe meaſure the longer; though this propoſition be a paradox, that quite puzzles and ſurpaſſes the imaginative faculty.

When we diſcourſe of infiniteneſs, or of almoſt any thing or any ſubject, to which it may belong, we uſually deceive ourſelves, and miſtake the firſt grand objection we meet with, for the only we are to ſurmount: whereas we ſhall often find, that the ſolution of one difficulty about infinity ſtarts others, and new ones, which may perhaps be found more perplexing, than that we firſt encountered.

Divers (for I cannot ſay all) of thoſe ſchool philoſophers, and others, that plead ſo earneſtly for the neceſſity of the rational ſouls (or the minds) contemplating, or making uſe of phantaſms in all its intellectual operations, have not perhaps well conſidered, that themſelves deny not, that, in extacies, the mind does (at leaſt ſometimes) act without turning herſelf to corporeal phantaſms. And ſince both *Ariſtotle* and his followers allowed immaterial intelligences, ſuch as they ſuppoſed to move the celeſtial orbs, it would be hard for them to deny, that theſe incorporeal ſpirits can act without the help of corporeal images. And this conſideration will hold againſt thoſe Chriſtian philoſophers and divines, who, whether or no they admit the celeſtial motors, newly mentioned, do believe, that there are angels, in the received notion of that name.

Argument III. *Eleuth.* I presume, *Juſtinus*, that your concern for the truth you maintain, will keep you from being offended, if I add, in favour of it, that, in my opinion, divers things are thought unintelligible; only becauſe they are not clearly propoſed, and dexterouſly explicated.

Juſt. You need not doubt, *Eleutherius*, that I ſhall willingly admit, or rather welcome, ſo good a ſecond; and I have great diſpoſition to aſſent to the judicious reflection you have offered: which therefore you have not only my conſent, but my deſire, to illuſtrate.

Eleuth. I conceive then, that divers myſteries and other articles of the Chriſtian religion would meet with much leſs oppoſition among men of parts, if they were warily and dextrouſly propoſed. For oftentimes the difficulty does not lie ſo much in the thing itſelf that is revealed, as in the additions of ſchoolmen, and others, that paſs for men verſed in philoſophy or other learning, have unſkilfully or needleſsly affixed to it. Thus they have given us ſuch notions of eternity, as it will be very hard for conſiderative men to comprehend or admit, and which are incumbered with difficulties, that I doubt are ſcarcely, if at all, ſuperable: and yet theſe may be avoided, if without affecting myſteries unwarranted by ſcripture, and nice ſpeculations, that are as well unneceſſary as perplexing; it were ſimply declared, what, without incongruity to revelation, right reaſon may lead us to think of the true notion of eternity. And how much the ſkilful or unſkilful way of propoſing a doctrine, may help to recommend or diſcommend it to a diſcerning man, I think may be gueſſed at by ſome things purely phyſical; as when the Peripatetics tells us of a *materia prima*, that is devoid of all forms, nay, and is *neque quid, neque quale, neque quantum, &c.* they would impoſe upon the underſtanding a thing, that is liable to inſuperable difficulties and objections. Whereas if we look upon matter, as being only a ſubſtance extended and impenetrable, which by means of motion is capable of being divided and variouſly modified, thoſe puzzling difficulties may eaſily be avoided. And ſo when vulgar philoſophers aſſert, that particular bodies, as a plant, a meteor, a metal, *&c.* does each of them conſiſt of the common matter and a peculiar form, they ſay nothing, that may not be admitted, even by true philoſophers. But when they will have theſe forms, that are but eſſential, to be ſubſtantial, as they call them, and yet neither material nor incorporeal ſubſtances; and when they will attribute to them ſuch ways of being produced, and of inexiſting, and of operating, as the ſchools lay ſo much ſtreſs on, they incumber the notion of a form with ſuperfluous things, that make it not only unintelligible, but inconſiſtent with ſome of their own doctrines, or with the obvious dictates of reaſon. Divers intricate queſtions in theology about man's free will, and the operations of the intellect upon the will, and of the will upon the intellect, may probably, as I have elſewhere ſhewn, be avoided, by giving ſuch a notion of the freedom of the rational ſoul, as juſtly owns its dependance on the firſt cauſe, but does not ſuppoſe the underſtanding and the will to be true faculties, really diſtinct from each other, and from the mind they belong to, which may determine itſelf from within immediately, or without the intervention of faculties, as the generality of divines think it neceſſary to acknowledge God to do.

* * * *

The ſecond of the two things I formerly mentioned, as thoſe, that induced ſome men of parts to quarrel with the Chriſtian religion, as delivering ſome things, that are unconceivable, is a moral indiſpoſition to admit the religion in general, and eſpecially thoſe myſterious articles of it, that they complain of, as

not intelligible. To this indiſpoſition many more things may contribute, than I have now time to mention; for which reaſon I ſhall take notice, and that but very briefly of three, that ſeem to be the moſt ordinary, and may be reckoned too among the principal.

AND firſt, it is but too eaſy to obſerve, that many, that complain of the obſcurity of ſeveral points of the Chriſtian religion, are ſuch, as will not give themſelves the trouble of ſuch a ſerious application of mind, as is for the moſt part neceſſary to the ſucceſsful ſtudy of difficult truths. For theſe require both attention and patience to perſevere long enough in that attention, which are things, whereto the lazy or faſtidious enquirers I ſpeak of, are generally ſtrangers, being of *Pilate*'s temper, who, when he had diſdainfully enquired of him, that was abler than any man in the world to inform him, what is truth, applied himſelf to other things without ſtaying for an anſwer. Theſe and the like reflections may keep us from concluding, that every article of religion is unconceivable, that is cenſured as ſuch, by men, that do not think it worth their pains to exerciſe that application of mind in the ſcrutiny of them, that is neceſſary to diſcover, whether they be really intelligible or not. And this concluſion will appear very reaſonable to him, that having had the patience and ſkill to examine the demonſtrations of the tenth book of *Euclid*, and thoſe of ſome propoſitions delivered by *Archimedes*, *Apollonius*, *Pergæus*, and *Pappus*, ſhall conſider what great and laſting application of mind was neceſſary even to thoſe ſublime wits, to attain to ſuch uncommon truths; and how unreaſonable it is to think, that nothing can be a truth, that may not be eaſily diſcovered to be ſo, eſpecially by ſuch men, as like too many of thoſe I have been ſpeaking of, have ſo accuſtomed themſelves to ſtudy nothing but hiſtorical, poetical, or ſuch other kinds of books, that do as much recreate as exerciſe the mind, have by an ill habit made themſelves no leſs unfit for difficult ſpeculations, than they are unwilling to go through with them; which it cannot well be hoped ſuch men ſhould do, that undervaluing the plain and perſpicuous doctrines of religion, ſhow, that they think the abſtruſe ones not worth the trouble of a laborious ſcrutiny. * * * *

Juſtinus. THE other thing, that I had to repreſent about the objection of thoſe, that cenſure ſome articles of our religion on this account, that they cannot conceive them, is, that divers of theſe articles are not unconceivable to them, that are duly qualified to penetrate the darker ſort of truths: and that one main reaſon (for others are mentioned in this conference) why theſe cenſorious perſons find themſelves unable to conceive, is, becauſe they will needs attempt to do it, without acquainting themſelves with thoſe diſciplines, or being furniſhed with thoſe previous notices, that are neceſſary by way of preparation, to fit the mind for the underſtanding of ſuch abſtruſe things.

Euſeb. I THINK your reflection ſo juſt, that I have often conſidered, not without ſome indignation, the arrogance of ſeveral ſuperficial wits, whoſe preſumption and lazineſs ſo far exceeds their patience and induſtry, that they think they have a right to pronounce all truths, whether theological or philoſophical, unintelligible, that cannot at the firſt attempt be comprehended, by the mere effort of their intellects, without being previouſly aſſiſted by proper informations. * * * *

Juſtinus. I THINK we may, not unuſefully with regard to our preſent purpoſe, diſtinguiſh truths into two ſorts. For there are ſome, that are of a more obvious, or at leaſt a more eaſily attainable kind, as lying nearer to the principles, from which they may be deduced, or to ſome other collateral proofs, from whence they may be inferred. And there are other truths of a more difficult diſcovery and penetration, becauſe they either lye much more remote from the ſpring head, if I may ſo ſpeak, or the fundamental principles they depend on, and therefore require a chain of mediums to infer them by, or elſe require to be expreſſed in ſuch terms of art, as a man will not underſtand without previous inſtruction, and an intellect capable of comprehending more than obvious or eaſy truths.

To illuſtrate this a little, by what is obſerved about the nobleſt and moſt conſpicuous inanimate body in the world; when a man deſires to underſtand, how the ſun comes to be ſometimes eclipſed, one may quickly ſatisfy him, by telling him, that at thoſe times the opacous body of the moon, happening to be interpoſed between the ſun and the earth, keeps thoſe beams of his, by which it ſhould be enlightened, from falling on it. And if the enquirer will further know, why the ſun never, without a miracle, ſuffers eclipſes but at the new moon, the anſwer needs be but ſhort, namely, that ſhe can never at other times directly interpoſe between the ſun and the earth. But if the ſame enquirer would underſtand, how it comes to paſs, that within the compaſs of a year, there are but few months, wherein eclipſes happen at the new moon, in compariſon of thoſe, wherein the conjunction of the ſun and moon produces no eclipſes; the queriſt cannot be ſo eaſily reſolved about this queſtion, as about either of the foregoing; becauſe the ſolution of the difficulty depends upon ſome knowledge of the motions of the moon with relation to the ecliptic, which is peculiar to aſtronomers. And if he further deſire to underſtand, why the days are ſo much longer in June than they are in December? Why at the ſame times of the year they are much longer in ſome countries than in others? Why the crepuſculum or twilight laſts very much longer in the midſt of June, than in that of September? Why in ſome countries the ſun by his preſence and abſence makes the days and nights always equal throughout the year; whereas in ſome others it makes a day of one, two, or three months long, and a night of the ſame duration? If I ſay, our

enquirer would understand these and the like things, or any of them, he cannot be made to do it by a short answer, expressed in the common forms of speech, but he must take the pains to learn the elements of astronomy, and the terms employed by those that teach it. * * * * *

* * * It is far from being all one, to consider a proposition as an absolute one, and to consider it as part of a system, where it is linked, and as it were enchaced with others, that are manifestly true, or granted, or demonstrable: as also there is a great difference, whether a proposition have premised to it what mathematicians call lemmata (that is truths previously demonstrated) purposely to clear it or not. For a thing considered in itself may seem false, or very unfit to be believed; which yet, when it is legitimately deduced from other truths, or is shown to have a strict connexion with them, ought for their sakes to be freely admitted. So that though it might be credulity to have assented to the solitary proposition, yet it is not credulity, but a rational belief, to assent to the proposition, when it is contained in manifest truths, or deducible from them. We must indeed judge first of the touchstone; but if we acquiesce in that, we must then judge by it. * * *

Argument IV. * * * If to what I have hitherto discoursed it be objected, that if any article of faith surpass our reason, however we may pretend to believe it, we really do not consider what we say. For faith is an assent to a revealed proposition upon the authority of the revealer: and since every assent (at least every rational one) either is, or includes an act of the understanding, which presupposes a knowledge of the thing assented to, we cannot possibly assent to, nor consequently believe any thing, that we do not understand, or have not a notion of.

This objection, I confess, is specious and considerable, but does not overthrow the discourse it oppugns. And to invalidate it, I must take leave to propose a distinction, which, though perhaps it may seem new, will not, I hope, appear either groundless or useless. I think then, that there are two kinds of notion, that men have of the same thing, or two degrees of knowledge about it: the first I call superficial or popular, the other accurate and satisfying.

Vid. reflect. on a Theolog. Distinct. §. 14.

By the former I mean such a conception of a thing, as suffices to discriminate it from other things, and give it a distinguishing appellation; though really the person, that has this notion, may not have attentively considered the object of it, and much less have fully penetrated its nature, and become able to give himself a well grounded satisfaction concerning the difficulties, that may occur about it.

And by the latter kind of notions, I mean those, that are accompanied with a great insight into the nature of the thing, one contemplates, together with the ability to give a rational account of the difficulties, wherewith the conception one embraces, appears, or may be shewn to be incumbered. These differing conceptions of the same thing may, I think, be illustrated and exemplified by the conceptions we have of time, place, local motion, continual quantity, and some few other things, that may be called primordial or primary, in respect of almost all the other things we are wont to treat of. For when, for instance, we talk of space, or place, we do not speak like parrots, in whom the words are not accompanied with any idea answerable to the thing spoken of. For we have a superficial notion of it, by which we distinguish it from time and motion, and convey the like notion to those that hear us; and so are able to understand one another, and make use of these popular, though but confused conceptions, to divers useful purposes. But then, if we go about to pry narrowly, and dive deep into the matter, we shall find the nature of space to be a very abstruse thing, and even the most received notions about it, to be liable to such difficulties and objections as are exceeding hard to be solved, if they be not altogether unanswerable by our imperfect reason; as those will scarce deny, that have, with me, attentively and impartially considered this subject. * * *

Vid. reflect. on a Theolog. Distinct. §. 16.

And I must here take leave to consider what is not wont to be observed, even by philosophers or divines; that there are two senses, if I may so call them, in which it may be said, that a thing is unconceivable, or implies things repugnant to the dictates of reason. For some things, *&c.* [Vide Reflect. upon a Theolog. Distinct. Sect. XII.]

* * * * And I shall add, that as for that most familiar thing, local motion, though modern, as well as ancient philosophers, and mathematicians have bestowed much time, and great pains, to explicate the nature of it; yet by arguing even about a thing, that those, who have not examined it, presume they know very well, we may bring our understandings into perplexities, from whence they will scarce be able to extricate themselves, *&c.* [Vide Reflections on a Theolog. Diction, *&c.* Sect. XXVII.]

* * * * Though in common discourse, it is usual enough to employ promiscuously the words unintelligible or inconceivable, incomprehensible, and incredible; and though I also do not always scruple to comply with custom in use of these terms, where there is no need of accurateness or nicety: yet on occasions, that require, that a man be critical in his expressions, I think it very fit and useful, to avoid confounding these terms; which on such occasions challenge distinct notions. By the word therefore inconceivable, or unintelligible, may be understood such a thing, as we cannot frame an idea or conception of, that is not either self-destructive (as having one part inconsistent with another); or else clearly repugnant to some manifest and acknowledged truth, whether taught us by meer reason, or by natural reason assisted by revelation. By incomprehensible may be meant such a thing, as, though

though we may frame symmetrical ideas of it (*i. e.*) such as are consistent within themselves, and not repugnant to any known truth; do yet contain or involve divers things, that we are not able throughly to penetrate, and perfectly to understand. And by incredible things, may be understood those, which, whether or no they belong to either of the former sorts, are not accompanied with such evidence of reason, as either do not probably, or at least do not sufficiently prove their truth, notwithstanding the objections, that seem to make them altogether unfit to be assented to. * * *

The other, and indeed the grand objection, by which philosophical adversaries endeavour to shake the faith of Christian philosophers, is, that the Christian religion enjoins the belief of some mysteries, that are incomprehensible. "For first, a man can scarce have been very well versed in the mysteries of nature, without having met with some things, if not many, so abstruse, as to reduce him to a sense or internal confession, of his being unable fully to comprehend them. And though a skilful mechanical philosopher may plausibly explicate many of these difficult phænomena in a general way, so as to shew, that they may be possibly produced, according to mechanical principles; yet the particular modus continues in the dark; and even the general explications suppose such a fabrick of the world, and such an origin, and such laws of motion, as involve difficulties, that confound our weak understandings."

But without further pressing this, let me add in the next place, "that if a free and impartial philosophiser have given his understanding the noble exercise of endeavouring to penetrate the obscurity and difficulties, that attend what opinion soever is pitched upon, about the endless divisibility of quantity, the infinity of space or extension, and the eternity either of God or of matter, he will (as far as I can judge, by what has happened to me, and divers others) sufficiently be convinced by his own experience, that they are disproportionate to our understandings. And he may also sensibly find, by studying the sacred writings, that it was fit, that some things of that sort should be declared by God, concerning his own nature, and his unparallelled manner of existing and of operating. And therefore he will not be seduced from believing a mystery, by its being incomprehensible, if the force of the proofs, that recommend it to his belief, be not so, but on the contrary be clear and cogent; such as the proofs of a doctrine perspicuously delivered in the holy scripture must appear to all those unbiassed men, that are satisfied of that book's having a truly divine authority. So that, on one hand, a man's own experience may assure him, that there may be truths incomprehensible to his reason: and on the other hand, the most authentically conveyed testimony of others, who wrought or recorded the miracles mentioned in the Gospel, may assure him, that he may safely, notwithstanding their incomprehensibleness, believe those mysteries, that such supernatural experiments bear witness to." * * *

* * * Though we know the more of any object, and so of God, the more of his properties or attributes we are acquainted with; yet this augmentation of knowledge is itself a mark and effect of the imperfection of it: since those differing conceptions of a divine object, whose nature is most simple, flow from the incapacity of our limited and imperfect understandings, to frame a conception, that shall comprehend the infinitely perfect nature of God in one single and simple idea; and therefore we are reduced to consider and represent him, as it were in parts; contemplating him sometimes as omnipotent, and sometimes as wise, and sometimes as just, *&c.*

* There are divers definitions, which, as they are commonly framed, are taken from the things defined, as they are found in the creatures; and on that score these definitions are not to be accounted true, full, and absolute ones, and are often erroneously applied to God and to divine things. But if the definition were made in its due and full extent, it might perhaps be applicable, though not adequate, to God, *&c.* * * *

And on this occasion give me leave to tell you, that even setting aside God (whom those, that acknowledge him, will confess to be incomprehensible) I fear, we men have too good a conceit of ourselves, when we think, that no such thing can have an existence, or at least have a nature or being, as we are not able to comprehend. For if we believe God to be the author of things, it is rational to conceive, that he may have made them commensurate, rather to his own designs in them, than to the notions we men may best be able to frame of them. On which occasion I would crave leave to represent, that it appears by the history of the creation, that the world itself was first made before the contemplator of it, man: whence we may learn, that the author of nature consulted not, in the production of things, with human capacities; but first made things in such manner, as he was pleased to think fit, and afterwards left human understandings to speculate as well as they could upon those corporeal, as well as other things. And if the world were not made by God, but was eternal, as the old Peripateticks thought it; or was made by chance, as the Epicureans held; there is yet less reason to believe, that there is any necessity, that the nature of primitive things must be commensurate to our understandings; or that in the origin of other things any regard was had, whether they would, or would not, prove comprehensible to men. * * * *

Argument V. * * * * * There is no necessity, that intelligibility to a human understanding should be necessary to the truth or existence of a thing, any more than that visibility to a human eye should be necessary to the existence of an atom, or of a corpuscle of air, or of the effluviums of a loadstone, or of the fragrant exhalations of a rose. And here we

may obſerve, that even by the ſame ſenſe ſome creatures may diſcern things, that may not be perceptible to others: as no attention or application of the organ (or the noſe) will enable a man to perceive the effluvia expiring from the ſtale footſteps of a hunted and unſeen hare, or deer; though hounds, and eſpecially blood-hounds, will have a vivid perception of ſuch odours, and by their help trace and perſue the flying and unſeen beaſt. * * * *

THERE are, as I conceive, two differing accounts, upon which things may be ſaid to be incomprehenſible. For firſt, ſome things there are, which ſeem not in their own nature to be beyond the comprehenſion of a human intellect abſolutely conſidered, or in its full extent; and which are not comprehended by us, but either becauſe they are not propounded and declared in as intelligible a way as they might be; or elſe becauſe we want fit mediums to raiſe and enlighten the mind, as far as it is capable of being aſſiſted, and as far as the ſublimity or abſtruſeneſs of the object requires. Thus the ſatellites of Jupiter, and the ſeparate ſtars, that all of them together make the milky way, are not diſcernible by our naked eye, only becauſe they are not qualified to receive beams enough of light to make the particular ſtars viſible, and yet the ſame eyes can manifeſtly and diſtinctly ſee them, when they are aſſiſted by a good teleſcope; which medium thoſe that are deſtitute of, can no otherwiſe than in vain ſtrive to diſcern ſuch remote though luminous objects. But there is alſo, I conceive, another ſort of things incomprehenſible, which are ſo, not out of a want of means to declare them to us, as far as we are able to be informed, but out of a want or capacity, or, if you pleaſe, of extent and penetration, that belongs to the mind itſelf, as it is of no higher an order of intellectual beings than human ſouls are. So that whatever pains be taken to inſtruct the underſtanding about ſome myſteries, its own limited and imperfect nature will keep it from a full comprehenſion of them. An analogical inſtance of this may be taken from the limitedneſs of our power to diſcern ſenſible objects, what attention or application ſoever we employ about them. Thus for inſtance, if a marble cube (or dye) of an inch every way be brought me, I can eaſily by my fingers, though my eyes are ſhut, perceive the figure of it to be cubical: and ſo I can, if a cube of but half, or perhaps a quarter, as great a bulk, be put into my hands, that I may find the figure of it. But if a heap of very fine powder of marble be brought me, I can by no attention and diligence in feeling, diſcern the figure of thoſe very minute grains of ſtone, that may chance to be cubical, or that of theſe other ſingle grains of powder, that are not ſo; becauſe I cannot graſp one of theſe with my hands, as I could do the firſt or ſecond entire cube, nor apply my fingers to its little faces and angles, ſo as to perceive what diſtinct ſhape it is of. And thus, though the eye cannot without help diſcern the eggs of a cheeſe mite, or the hair, that grows on the moving ſpeck; and though by the help of a good microſcope the eye may plainly diſcover them; yet no microſcope will enable it to ſee the minuteſt corpuſcles, that compoſe a great part of the air, nor the eel-like particles, that the Carteſians think water to conſiſt of; becauſe the fibres, or other parts of the retina, or of the principal part of that organ that viſion is made upon, are not fine and tender enough to be moved and affected by ſuch very minute particles, as thoſe we are ſpeaking of. So that the inviſibility of theſe does not proceed from the want of inſtruments, or helps of viſion, but from the original imperfection or diſability of the eye itſelf, which in its own natural conſtitution, though induſtriouſly aſſiſted, is diſproportionate to the objects attempted to be clearly diſcovered by it. * * * * *

OCCASIONAL THOUGHTS.

IN my opinion it is both ſtrange and unjuſt, that our quarrellers with religion ſhould require, that we, that embrace it, ſhould give them clear and direct ſolutions of all the difficulties, which (perhaps not without racking their wits to find them) they are able to object againſt theological myſteries, whilſt in the mean time themſelves are not able to give a ſatisfactory account of the difficulties, that attend the diſtinct explication of merely corporeal, and perhaps too very familiar ſubjects. Inſomuch, that thoſe very men rigorouſly exact, that we ſhould explain to them the myſteries of the Trinity, or the incarnation of the ſecond perſon of it, that cannot clearly ſhew, what keeps the parts of the leaſt portion of matter together, or how, when they have a mind to ſpeak, their own ſouls can direct the animal ſpirits to all the little organs, that are neceſſary to the formation of a vocal diſcourſe, without knowing, how the vocal organs are framed and ſeated, or perhaps ſo much as, whether they have this or that particular muſcle (for inſtance) in their body or not.

THOUGH God may oblige us to believe propoſitions, that contain ſomething, that is incomprehenſible to us, yet he obliges us but to believe, not to underſtand them, that is to aſſent to a propoſition as true, becauſe he aſſerts it, but not to have a clear and determinate notion of the nature of the ſubject; or at leaſt ſuch a one as is free from perplexing, if not inſuperable difficulties.

BECAUSE there belongs to numbers a kind of infinity, or ſomewhat, that is near of kin to it, we muſt, if we want not attention or ſkill, diſcover by the incompetency of our utmoſt endeavours the boundedneſs of our human underſtandings; ſince when we have propoſed a determinate number as great as we are able to aſcend to, yet we are ſenſible, that it is not abſolutely the greateſt of numbers, ſince it may be augmented by the addition of an unite, or an aggregate of unites.

We muſt not ſuppoſe, that at leaſt in our preſent ſtate, our reaſon and other faculties are given us, to reach all things, that are knowable, even as to corporeal creatures; but only things, that are in ſuch a ſphere of intelligibility, that they are proportioned to our preſent faculties, and convenient for our notice in our preſent ſtate or condition. As our eyes are not given us to ſee all that is viſible, and might be diſcovered by us, in caſe they were framed, ſometimes like teleſcopes, and ſometimes like microſcopes; but to diſcover thoſe viſible objects which are not ſo very minute, or ſo remote from us, but that it may concern us in point of ſafety or welfare, to diſcern and diſtinguiſh their bulk, diſtance, figure, colour, *&c.*

Argument VI. *Juſtinus.* There is, gentlemen, another reflection, that I muſt by no means leave unmentioned, before I diſmiſs *Authades*'s third objection. For whereas moſt of the grand difficulties in Chriſtianity, whoſe abſtruſeneſs is wont to offend ſuch as he, are afforded by ſome things, that are in the holy ſcripture delivered about God's nature, and ſome of his attributes; and about ſome ways of acting, that are, together with their ſtrange effects, aſcribed to him: to remove, I ſay, or leſſen theſe difficulties, I conſider and repreſent, that, "ſince God is a moſt ſingular being, it "may be juſtly thought, that many things "may belong to him, or may be truly ſaid of "his attributes and operations, that are in-"explicable and unmatched."

This will appear the more probable, if we conſider, that though we have abundant cauſe to believe, that God is by unmeaſurable degrees ſuperior to his works; yet there are many of his creatures, and things, that depend on him, that have a very peculiar, and (if I may ſo call it) monadical nature, which makes them very different from all the other beings we are acquainted with. * * * *

* * * That ſome rules, that reach to all the creatures they are capable of being applied to, will not hold in God, may appear by this, that though eſſence and exiſtence are different or ſeparable things in created beings, they are not ſo in God. And though even the rational ſoul (or mind) is, according to divines and philoſophers, indowed with faculties properly ſo called, and diſtinguiſhable from its eſſence, yet in God it is generally acknowledged to be otherwiſe, according to that received axiom; *Quicquid eſt in Deo, Deus eſt.*

* * *. And therefore we are not to wonder or be ſtartled, if a nature ſo ſublime, and in divers points ſo unparallel as that of God, cannot be thoroughly explained or illuſtrated by any other, upon the ſcore of a competent reſemblance; and cannot be fully comprehended by a faculty ſo diſproportionate unto it, as is our human intellect; which yet is ſo much more limited in its nature, than it is uſually in its preſumption, that in moſt men, what it is not able clearly to underſtand, it is forward to reject and cavil at. And the ſame ſublimity and abſtruſeneſs of the divine nature, which provokes this arrogance of the intellect, does ſupply it with very plauſible arguments to make this arrogance appear reareaſonable; ſince the difficulties, that incumber the theories of monadical and primary beings, whoſe nature is much leſs remote from, and far leſs diſproportionate to our faculties, than that of God is, have ſome of them proved inſuperable to human reaſon.

I come now to the laſt conſideration I ſhall employ to induce you to think, that divine myſteries, ſuch as Chriſtians acknowledge to be here and there recorded in the ſcripture, are to be aſſented to, though we cannot fully conceive them. For ſince we have lately ſeen that even the beſt philoſophers themſelves confeſs, that there are ſome truths, which our bounded reaſon is not able fully to comprehend, we ought not to think it incongruous, or incredible, that divers things relating to God's nature, and ſome others relating to his attributes, decrees and actings, ſhould not be fully comprehended by us; for here I conſider, that, before it pleaſed God, out of his exuberant goodneſs, to make ſome communications of himſelf *ad extra*, he was not only a ſingular, but the ſingle being, there being no real one, beſides himſelf. And ſo when he was pleaſed to create other beings, as he did it freely and uncompelled, ſo he gave to each of thoſe he created ſuch a nature, and ſuch determinate faculties and powers as he pleaſed. And of the beings, which he created intelligent, among which are the rational minds of men, he endowed each ſort or order with ſuch a meaſure or degree of the intellectual faculty, as he thought fit, for the ends and purpoſes, for which in his infinite wiſdom he created them; but to none of theſe did he impart a knowledge boundleſs as his own, that infinite knowledge being the eſſential prerogative of God, and not communicable to any mere creature.

By what Jeſus Chriſt, ſpeaking of the preciſe time of his coming to judge either the Jews, or the world, pronounces, that no man knows it, no, not the angels in heaven, nor the Son of man, that is, the Meſſiah himſelf, but the Father only; from this gradation, I ſay, and the exaggeration, that accompanies it, we may very probably gather, firſt, that there are different orders of intellectual beings (which may be confirmed by what the apoſtles teach of angels and archangels, and alſo of thrones, principalities, and powers, *&c.*) Secondly, that theſe different orders are indowed with differing meaſures of knowledge. And thirdly, which makes principally for our purpoſe, that none of theſe are ſuch degrees of illumination, as to enjoy a knowledge equal to that God.

Upon how many accounts God is a moſt ſingular being, our dim and bounded intellects are not able to enumerate or diſcern, but ſome prerogatives are manifeſt enough: As 1. God's ſelf-exiſtence, and his having his actual exiſtence included in the idea of his eſſence. Next, his independency from the other be-

ings whatſoever. 3. His eternity. 4. His ſelf-ſufficiency. 5. His omniſcience. 6. His immenſity and omnipreſence. 7. His ſimplicity, or immunity from all compoſition. 8. His being the cauſe of the univerſe, and all the created ſubſtances that compoſe it. So that, indeed, he is the only ſubſtance, in the ſtrict ſenſe of that word, as it is taken in, when it is defined a being that ſubſiſts of itſelf; ſince no being but God can ſubſiſt by its own power, but muſt be continually upheld by the conſtant influx of the conſerving power of God. There are divers other properties, that diſtinguiſh God from all other beings, and exalt him far above them. It would lead us into an obſcure maze, if I ſhould attempt to enlarge upon each of the newly mentioned particulars, and the ſimplicity alone and infinity, that are unanimouſly aſcribed to the Divine Nature, when they came to be ſomewhat attentively looked into by theologiſers, reduced them to confeſs, that though juſtice and mercy, and many other attributes, that ſome of them ſeem to be contrary to one another, may be truly aſcribed to God, yet in effect they are but inadequate notions of the ſame moſt ſimple being, and that reaſon of teaching ſuch attributes to be found in God, is that by reaſon of the imperfection of our underſtandings, which cannot at one view give us an entire idea of that perfect being, we are reduced to frame inadequate notions of his perfections, that we may, as far as we can, have an idea in parcels of what we cannot comprehend at once: but I muſt not loſe my ſelf by further proſecuting this diſcourſe, but deſiring you to recal to mind, what was not long ſince delivered about thoſe, that philoſophers themſelves acknowledge not to be ſufficiently comprehenſible by our limited intellects; I ſhall haſten to make ſome ſhort application of the paſt diſcourſe.

To the third objection, it was anſwered.

1. THAT our knowledge is very imperfect, even of natural things.

2. THAT if there be ſcarce ſurmountable difficulties in the conceptions of things corporeal, it ought to be granted, that there are greater in things ſpiritual and ſupernatural.

3. THAT divers things are thought unintelligible, only becauſe they are not clearly propoſed and dextrouſly explicated.

4. THAT of divers things, we can have an idea, which, though ſomewhat dim and indiſtinct, may yet be true, and to ſome good purpoſes uſeful, though it be not clear and ſatisfactory. And that of other things we may have a true conception, that is produced by illation, though not by intuition, or clear and direct view.

5. THAT reaſon ought to acknowledge, that there are or may be ſome things not comprehenſible by her, whilſt left to her own natural light; and that *Ariſtotle*, *Carteſius* and *Gaſſendus*, have confeſſed it.

6. THAT God being a moſt wiſe and ſingular being, many things may be juſtly thought to belong to him, that are inexplicable and unmatched.

OCCASIONAL THOUGHTS.

To judge any thing well of ſome ſublime truths, that relate to God's nature and perfections, a man muſt firſt deſcend into himſelf, that is, into his own mind; which being created after the image of God, he may there diſcover, both many things, that God is not nor can be; and divers things, that God may in a ſound ſenſe be ſaid to be. But then he muſt not ſtay there, but raiſe himſelf above himſelf, by contemplating leſs mediately and more directly the attributes of the Deity, as they belong to the true idea of the ſupremely perfect being; and differ from the notions we frame of the creatures; ſome of them in the very kind, as being no where to be found out of God; and the reſt (which are in ſome ſort participated by the creatures) in the infinitely ſuperior degrees of perfection, and an immunity from all detracting or leſſening limitations.

IF it be urged, that there are ſome things belonging to the notion of the Deity, that are unconceivable; I anſwer, that we ought not to think it ſtrange, that a ſpiritual being of an incomparably more excellent nature than ours, ſhould have ſome attributes, and be able to perform ſome things, that we men do not comprehend; ſince there are natures and phænomena even in the corporeal world, that diſtreſs and baffle our reaſon.

SOCRATES might perhaps juſtly be commended, for drawing down philoſophy from heaven to earth; but I much doubt, whether they do as well deſerve our praiſe, who draw down ſpeculative theology, and the notions of divine attributes, to reſemblances to the inferior natures of created beings.

SINCE men themſelves can mathematically demonſtrate the infinite diviſibility of quantity, as for inſtance, of a line; God, who has an infinite intellect, may juſtly be ſuppoſed to have a diſtinct view of the manner of it, and not only know, that the line is diviſible, without end, but comprehend how it is ſo, and muſt neceſſarily be ſo.

CONFERENCE IV.

Eleutherius. I PRESUME, gentlemen, that we ſhall the more chearfully fall upon the work of this meeting, becauſe we have now made ſuch a progreſs in *Authades*'s objections, that we are arrived at the laſt of the four, that we were told, at the beginning, he mainly relies on. And therefore it will be ſeaſonable to deſire *Manlius* to help us to diſpatch the remaining part of our work, by giving us occaſion to anſwer *Authades*'s fourth argument.

Manlius. IT may be eaſily propoſed, gentlemen; but if *Authades* be not much miſtaken, it will not be ſo eaſily anſwered; for he takes it for granted, and thinks all rational men do ſo too, that truth can never be contrary to itſelf, and conſequently, that there is ſo perfect an agreement

agreement betwixt all truths, that any doctrine, that is contrary to any truth, muſt itſelf be no truth, but ought to paſs for an abſurdity, a falſity, or an error. This being ſuppoſed as manifeſt by its own light, he conſiders, that reaſon is the faculty, that God has given men whereby to diſcern the ſettled relations and reſpects of things, and ſo to judge of the conſiſtency and incompatibility of notions and dogms, and the agreement or contrariety of propoſitions, which is done eſpecially when reaſon is aſſiſted by philoſophy, which being but reaſon improved by meditations, diſciplines, and experience, he reſolutely concludes, that divers ideas, dogms, and hiſtorical paſſages, that are propoſed as articles of the Chriſtian religion, cannot be rationally aſſented to, becauſe they are repugnant to the dictates of philoſophy.

Juſtinus. THE objection, I frankly confeſs, would be a very weighty one, if it could be as ſolidly proved, as it is ſpecious, when propoſed. It would perhaps appear, even to the propoſer of it, to be ſufficiently enervated, if I were allowed to produce here a couple of dialogues, made on different occaſions, by our common friend, Mr. *B.* to diſcuſs *ex profeſſo*, the two queſtions; in what ſenſe faith may, and in what it may not, be ſaid to be contrary to reaſon; and whether theology and philoſophy do really contradict each other. And though I will not, without his permiſſion, diſpoſe of thoſe writings, yet I know him to be ſo affectionate to the cauſe, that *Authades*'s objection ſtrikes at, that ſince it is uncertain, when that diſcourſe will be made publick, if ever it be ſo; he will eaſily forgive me, if I borrow ſome paſſages of his dialogues, to mingle with, and ſtrengthen thoſe conſiderations, that on this occaſion I ſhall offer in anſwer to the objection newly propoſed by *Manlius*.

Argument I. I SHALL then, in the firſt place, deſire, it may be conſidered, that the word philoſophy being on ſeveral accounts ambiguous, and particularly being ſometimes employed in a more large and comprehenſive, and ſometimes in a narrower and more reſtrained ſenſe; it is very poſſible, and perchance not very rare, that a propoſition, or notion, may be looked upon as contrary to philoſophy, without being ſo in reality. For thoſe, that paſs for philoſophers, are divided into divers famous ſects; ſuch as the Peripateticks and Pythagoreans, the Eclectics, the Epicureans, the Stoics, the Platoniſts, the Hermetics, and the Carteſians: and divers of thoſe, as the Platoniſts, are alſo ſubdivided into ſeveral ſchools, as thoſe of the ancients, the new and middle ſort of academics: and yet it is not unuſual for each of theſe ſects or parties to be ſo fond of its own opinions, as to adorn the ſyſtem, or aggregate of them, with the glorious title of philoſophy, and its profeſſors with that of philoſophers, and that oftentimes excluſively to all others. And ſo when a Peripatetic, or an Epicurean, pronounces, though never ſo confidently, that this or that opinion is repugnant to philoſophy, he means, that it is ſo to his. And an impartial, judicious by-ſtander will take the aſſertion in no other ſenſe, and will not think it ſafe to conclude, that it is therefore repugnant to ſound philoſophy itſelf.

Eleuth. AND he acts but rationally, when he thus proceeds. For true philoſophy is not to be ſought for, only in the walks of *Ariſtotle*, nor the porch of *Zeno*, nor the gardens of *Epicurus*; for it is a thing of a more noble nature, and of greater extent, than the hypotheſis of any one ſect of philoſophers, being indeed a comprehenſion of all the ſciences, arts, diſciplines, and other conſiderable parts of uſeful knowledge, that the rational mind can attain to, without ſupernatural revelation, by reaſon, that is improved by meditation, literature, exerciſe, experience, and any other help to knowledge. By which notion of philoſophy one may eaſily diſcern, that it is unfit to confound Peripateticiſm, Platoniſm, Stoiciſm, or the peculiar dictates of any other particular ſect, with philoſophy itſelf, as if they were terms of the ſame import and extent. Though that ſect ſeems to lay the moſt probable claim to the title of philoſophy, that ſome call the Potamonian ſect, others the Eclectic; ſince the profeſſors of it did not confine themſelves to the notions and dictates of any one ſect, but in a manner include them all, by ſelecting and picking out of each that, which ſeemed moſt conſonant to truth and reaſon, and leaving the reſt to their particular authors and abettors. So that in my opinion, one may compare the particular ſects of philoſophers to ſo many meadows, where flowers grow thinly and diſperſedly, and the Eclectic party, or Potamonian ſect, to a poſy, that conſiſts only of thoſe ſeveral flowers gathered out of the ſeveral meadows, and united in one bundle.

Euſebius. To be convinced, that there is a great difference between philoſophy, abſolutely conſidered, or in its full extent, and the philoſophy of a particular ſect, as the Peripatetics, Epicureans, or Stoics, though it appropriate that name to the ſyſtem of its own doctrines; we need but conſider, how often, and how directly theſe ſeveral parties contradict one another, even about dogms of great importance. I will not urge, that the felicity or ſupreme good of man is, except God himſelf, the nobleſt object of human ſpeculations, or at leaſt that, which is of the higheſt concern to men; yet even about this ſo very important ſubject, philoſophers have been ſo ſtrangely divided in their opinions, that an ancient writer informs us, that there were in or before his time, no leſs, if I miſ-remember not the number, than two hundred eighty eight differing opinions of philoſophiſers, concerning the *ſummum bonum*. This I ſhall not inſiſt on. But perhaps it will be more proper to take notice of a few inſtances of the repugnant dogms of philoſophic ſects, about the efficient, the nature or principles, and ſome grand affections of things corporeal.

THE Peripateticks held the world, ſuch for the main as it now is, to be eternal. *Anaxagoras* and

and his diſciples held, that the world, as ſuch, was preceded by a rude maſs of matter, which by an intelligent mind (which was his famous νῦς) was divided, and had its parts put into motion, and contrived into the world. And the Epicureans, together with *Leucippus*, *Democritus*, and other atomiſts, were ſo far from allowing the world to be either eternal, or made by a divine being, that they held it to be but recent; and maintained, that it was formed only by the caſual concourſe and juſtlings of atoms. The *Ariſtotelians*, and divers other ſects of philoſophers, believed, that the world, as it had no beginning, ſo it ſhall have no end; whereas the Stoics held, that this preſent world of ours will be in the capacity of ſuch a world, deſtroyed by fire. And the atomical philoſophers, as *Democritus*, *Epicurus*, *&c.* taught, that this world of ours, as it was caſually framed, ſo it may by ſeveral accidents happen to be diſſolved. The Ariſtotelians aſſerted, that the three principles of all natural bodies are, matter, form, and privation. Theſe the Epicureans ſlighted, and few, if any, of the other ſects fully approved. The Peripateticks maintained, that *Quicquid movetur, ab alio movetur*, which dogm the Epicureans were ſo far from admitting, that they maintained, that every the leaſt parcel of matter, that is found in the world, that is, every atom, has not only an intrinſic power of moving itſelf, but has it in ſo eſſential a way, that it can never loſe it, though when it is joined with other atoms in concretions, that combination may ſuſpend the prevalent exertion of it. The Ariſtotelians, Epicureans, and moſt of the other ſects of philoſophers, as well as the generality of mankind, held the terraqueous globe to be immoveable, in the middle of the world: but *Pythagoras* and his ſect, and, as I find by *Ariſtotle* himſelf, ſeveral Italian philoſophers, held the ſun to be in the middle of the univerſe, and that the earth is a planet, which, together with the other planets, does continually move about it. I might add that famous controverſy about vacuum, in which the Ariſtotelians were great champions for the affirmative, which is alſo embraced by moſt of the other philoſophers. And yet *Epicurus* and the reſt of the atomiſts, did not only aſſert vacuum, both interſperſum and (as they ſpeak) coacervatum, but maintained, that without admitting at leaſt the former, it was impoſſible there ſhould be any motion among bodies. But it were too tedious to enumerate the repugnant dogms of the ſeveral ſects of philoſophers, even about principles, and other very weighty points. And I think, I have ſaid more than is ſufficient to ſhew, that, if we would ſhun acting either raſhly or unſkilfully, we muſt not be forward to conclude a myſtery of faith, or other article of religion, to be contradictory to philoſophy, abſolutely taken, becauſe it is ſo to the Peripatetick philoſophy, or to that of ſome other particular ſect.

Juſtin. I READILY grant, *Euſebius*, that you, that, I know, have read *Laertius* of the lives, and *Plutarch* of the dogms of the philoſophers, beſides other authors, that have treated of thoſe ſubjects, may eaſily multiply inſtances of the contradictions, that may be met with among the famous ſects of philoſophers; nor do I doubt, that theſe you have already mentioned may ſufficiently warrant you to infer, as I preſume you intend, that it is not allowable to conclude, that, becauſe this or that myſtery of faith, or article of religion, is repugnant to the doctrine of this or that particular ſect of philoſophers, though perhaps appoved by ſome others, it is therefore repugnant to philoſophy itſelf. And as I readily grant you this, ſo I ſcarce doubt, but you will allow me, not only to make uſe of the repugnant ſentiments of the ſeveral ſects of philoſophiſers, to throw off or weaken the objections grounded on their authority, but to take advantage of the credit of the diſſenting parties, and the arguments they employ, one againſt another, for the defence of the articles of religion.

THUS the arguments employed by the Epicureans for the novelty, as they expreſs it, of this world of ours, may be very ſerviceable to a divine, for the confutation of the Ariſtotelian dogm of the eternity of the world, which is more unfriendly to religion, than its modern embraces ſeem to be aware of. And on the other ſide the doctrine of *Ariſtotle* and the Platoniſts too, (to mention no others about intelligent ſubſtances, that are immaterial, may be of good uſe againſt the Epicureans,) who flatly denied all incorporeal ſubſtances. One may alſo oppoſe the authority and doctrine of *Anaxagoras*, who aſſerted matter to be of itſelf moveleſs, and originally put into motion by a divine intellect, which out of that ſhapeleſs maſs framed this beautiful world, to the contrary tenet of almoſt all the Peripateticks, and thoſe other ſects, that held the world to be unmade. And the ſame *Anaxagoras* may be made a champion againſt the Epicureans, who aſſerted the world to be produced by chance, and not by any intelligent and deſigning agent. Againſt the ſame Epicureans, who taught, that every atom had in it an eſſential and unloſable principle of motion, one may oppoſe the reputation and the arguments of *Ariſtotle* and his followers, who taught, that *quicquid movetur, ab alio movetur.* * * *

Juſtinus. That it is one thing to contradict the ſentiments of this or that church, and (*à fortiori*) of this or that ſchool, or particular divine; and another to contradict an article of faith really delivered in the ſcripture. Argumen III.

As we did lately upon good grounds make a difference between philoſophers and philoſophy, ſo we may now with as good reaſon diſtinguiſh between theologers and theology; by the former appellation underſtanding thoſe that aſſume, or have obtained the title of divines, preferable to other men of the ſame religion; and by the latter the body or ſyſtem of theſe truths, that have been communicated to men by ſupernatural revelation, whoſe grand repoſitory is that book we call the bible.

I PRESUME

I PRESUME it will not be difficult to induce you to allow of this diſtinction: for one needs not be half ſo well acquainted, as thoſe I ſpeak to are, with eccleſiaſtical hiſtory, and the preſent ſtate of the church in the world, to know, that ever ſince the firſt ages of Chriſtianity, and in them too, as much as in others, the profeſſors of that religion have been diſtinguiſhed into various parties and ſects, ſuch as Gnoſtics, Ebionites, Carpocratians, Manichees, Arians, Photinians, Eutychians, Neſtorians, and divers others, whoſe names are famous, and whoſe dogms, as to divers of them, have found approvers even to this day. Now theſe ſects differing almoſt as much in dogms, as in affections, ſo that the embraces of the one called itſelf orthodox or catholick, and thoſe of the other hereticks, and on that account they perſecuted, and as much as in them lay, damned their opponents, and ſometimes (which was more certainly miſchievous) killed them; it is obvious to conclude, that we may juſtly diſtinguiſh between an article, which this or that church holds to be of faith, and an article, that is indeed a part of theology, by being a ſupernaturally revealed truth; and conſequently, that a tenet of this or that church may be contracted by ſome philoſophical principle or dogm; and yet ſound philoſophy, and orthodox divinity, continue good friends.

AND I ſhall by your permiſſion, *Juſtinus*, preſume to add, that though not only two or three churches or ſchools, but almoſt all thoſe of Chriſtendom, ſhould agree in a dogm, ſuch as it may be, that would not keep me from thinking, that even in this caſe, what you have been ſaying will hold good. For beſides thoſe revealed dogms, that are expreſsly, and as it were immediately delivered in the holy ſcripture, and may, on that account for diſtinction's ſake, be called primary, or more immediate ones, there are divers others, that may be ſtiled derivative, or leſs immediate dogms of divinity; becauſe they are not ſo clearly taught in the ſacred writings, but are (whether juſtly or not) preſumed to be drawn thence by diſcourſes and a chain of inferences grounded on principles of mere philoſophy, and becauſe they have been drawn by divines, and were ſubſervient to ſome hypotheſis of theirs; they were by them adopted into the family of theological verities, and many of them are to this day embraced on their authority by their admirers, as articles of faith. Now, little to the advantage of the Chriſtian church, it has frequently happened, that theſe foreign doctrines have been deduced from the principles and tenets of particular ſects, and eſpecially thoſe of the Peripateticks, many of whoſe dogms, that ſerve for foundations to the articles we ſpeak of, may be diſcovered by mere natural light to want ſolidity themſelves. Wherefore ſince in concluſions, that are drawn from premiſes of different kinds, ſuch as in our caſe are ſupernatural truths and philoſophical dogms, the concluſion muſt be of the nature of the weakeſt of the premiſes (according to that known rule in logicks, *Concluſio ſequitur debiliorem partem*; we have no more certainty of the truth of theſe reſulting doctrines, than we have of the truth of the philoſophical principle or dogm. And the concluſion of this ſort, though by divines received into the liſt of theological truths, may be repugnant to a genuine article of faith, without inferring a real contradiction between philoſophy and theology. Since true theology does not appear to be ſo concerned in the caſe, and all the contradiction is between a dogm of ſound and one of erroneous philoſophy.

Juſtinus. ANOTHER thing there is, which, if it be well conſidered and applied, may in ſeveral caſes take off the repugnancy, that is pretended to be irreconcileable between ſome doctrines taught by the ſcripture, and ſome dictates of philoſophy, if not alſo of right reaſon itſelf. Argument IV.

Euſeb. I SHALL be glad to learn what ſo deſirable an expedient may be.

Juſtin. IT is (in ſhort) this, that many do not know, and more do not duly conſider, and rightly apply the ſeveral conditions, that are requiſite to make a true, and properly ſo called, contradiction, betwixt propoſitions or doctrines.

Eleuth. THESE conditions are not wont to be mentioned by the writers of logick; but by moſt of them, as far as I have obſerved, either lamely or obſcurely, or perfunctorily enough. And therefore it may conduce to the clearing of the ſubject you are upon, to take a diſtinct notice of them.

Juſtin. IF you will have it ſo, I ſhall obey you, by telling you, though not to inform either you or theſe gentlemen, but to refreſh our memories, that to make a contradiction, ſtrictly ſo called, between two propoſitions, there muſt concur four things as neceſſary conditions.

THE firſt is, that both the affirmation and the negation, that are oppoſite, be taken or underſtood *ſimiliter*, that is in like manner: as if it be ſaid by one man, that the ſun or a ſtar, when it is come to the meridian, neceſſarily moves downwards, and by another, that it does not move downwards; there may be no contradiction between them, in caſe the latter pretends only, that the ſun or ſtar does not move downwards in a ſtrait line, as if it fell directly towards the centre of the earth, (in ſuch a line, as mechanicians call the line of direction) and the other means, that in reſpect of its meridian height, it moves downwards towards the horizon in an oblique line. So to ſay, that "man is an animal neceſſarily pro-"duced by the congreſs of a man and a "woman;" and that it is "not true, that "man muſt neceſſarily be ſo produced," are propoſitions not irreconcileably repugnant, becauſe the former ſpeaks of production by generation properly ſo called, or made according to the courſe of nature, whereas the latter ſpeaks of production made by creation, which is a ſupernatural way, as in the caſe of *Adam* and *Eve*, that were both formed without the concourſe of man and woman.

Manlius. If I miſremember not, *Juſtinus*, this firſt condition is left unmentioned by ſeveral of the writers of logic.

Juſtin. I ſhall not, *Manlius*, contend with you about that, not that I think the condition ſuperfluous; but becauſe it is poſſible the omitters of it preſumed it to be referable to one of the three other conditions, that remain to be mentioned.

The firſt of theſe, which is the ſecond of the four, is, that the oppoſition be made *ſecundum idem*, as they ſpeak, that is according to the ſame part, or ſomewhat that is analogous to a part of the ſubject, that is ſpoken of. For ſome things are as it were compoſed of ſeveral natures, and very many things conſiſt of ſeveral parts ſeparable, either really, or at leaſt mentally. And that may be true, as to one part, which is not ſo as to another, or as to the whole ſubject, that conſiſts of thoſe parts properly or analogically ſo called. Thus man, who conſiſts of a rational ſoul and a human body, may be ſaid without contradiction to be mortal, and immortal; the latter in reſpect of his ſoul, and the former in reſpect of his body. Thus the earth may, without a true contradiction, be ſaid to be naturally incorruptible, and yet to be ſubject to corruption, if the former propoſition be meant of the whole globe, and the other of ſeveral particular parts of it. And in the vulgar hypotheſis of philoſophers and aſtronomers, it may be ſaid to be immoveable as to its entire body, but moveable as to ſome conſiderable parts of it, as has been manifeſted by the local changes made of great maſſes of terreſtrial matter, in ſome very notable earthquakes; and ſo it may without a contradiction be ſaid, that a negro is black, and that a negro is not black, if the former propoſition be made of his ſkin, and the latter of his teeth, which are uſually very white.

The third condition is, that the oppoſition be *eodem tempore*, that is, that the repugnant propoſitions ſpeak not only of the ſame ſubject, and part of the ſubject, but of the ſame time. Thus it is no contradiction to ſay, that a roſe buſh flouriſhes, and a roſe buſh does not flouriſh, if in the former aſſertion one means in ſummer, and in the latter in the middle of winter.

The fourth and laſt condition of a true contradiction is, that the propoſition, wherein it is ſaid to be found, be meant of the thing ſpoken of in the ſame regard, that is in compariſon of, or with relation to the ſame third thing: as a man of ordinary ſtature may without contradiction be ſaid to be tall, namely in reſpect of a dwarf, and low, that is not tall, if he be compared to a giant.

Euſeb. It will not be difficult, *Juſtinus*, to foreſee, what uſe you may make of what you come from ſaying.

Juſtin. True, for it is obvious enough, that we may thereupon make this reflection, that ſince the concourſe of all theſe four conditions is requiſite to make a contradiction properly ſo called; there may be ſeveral revealed doctrines, which are pretended to be contradictory to ſound philoſophy or right reaſon, without being ſo in reality, becauſe in the oppoſition between theſe doctrines and the dictates, whereto they are preſumed to be repugnant, there wants ſome one, if not more of the conditions, that have been made appear, to be neceſſary to a true and irreconcileable contradiction.

Juſtinus. There is another conſideration, gentlemen, which, I preſume, it may not be impertinent to propoſe on the preſent occaſion. And it is this: There may be a current dictate of philoſophers, and even ſuch a one as paſſes for an unqueſtioned theorem of philoſophy itſelf, which yet cannot be ſafely relied on, if it be applied, either to things, for which it was not made, and is not proper, or to ſuch as are not clearly underſtood. And that therefore it is not neceſſary, that whatever article of religion is repugnant to ſuch a dictate or theorem, muſt be alſo repugnant to philoſophy and to right reaſon. Argument V.

Eleuth. Though I ſee nothing, that ſtartles me in what you have delivered, *Juſtinus*, yet ſince it ſeems to reliſh of a paradox, it will not miſbecome you to acquaint us with, at leaſt, ſome of the reaſons, whereon you ground it.

Juſtin. Your expectation is juſt, *Eleutherius*, and therefore to anſwer it, I ſhall deſire the company to conſider with me, that languages, at leaſt thoſe we commonly uſe, have been introduced by the vulgar ſort of men, whoſe apprehenſions of things are but narrow and ſuperficial; the natural weakneſs of their faculties, and their aſſiduous converſation with only ſenſible or familiar things, that it concerned them to ſpeak of to one another, keeping them from extending their thoughts to the great variety of things, and from making deep inſpections into the nature of almoſt any. But it is not only the unthinking vulgar, but learned men, and even famous philoſophers, that have preſumed to give us general axioms upon inſufficient inductions, and without thoroughly penetrating the differing natures of the things included in thoſe comprehenſive axioms. Whence it is come to paſs, that divers theological truths are held to be repugnant to philoſophy, becauſe they are ſo to theſe ill framed or miſapplied notions or dictates.

Eleuth. In favour of your ſentiments, *Juſtinus*, I ſhall repreſent to *Manlius*, that, as children by reaſon of the infirmity of their underſtandings, and their fondneſs of the objects, that are proportioned to their preſent ſtate and affections, mind little or nothing, but thoſe objects, that gratify or offend their ſenſes, or their imagination; ſo when men began to ſpeculate a little, and were, as it were, in the infancy of philoſophy, their reaſonings and diſcourſes were probably but narrow and ſuperficial, and as they were ſuggeſted by, ſo they did not riſe much higher, or reach much farther than thoſe objects, that were uſually converſant about, and were conducive to their welfare, as they led an animal life, and were engaged in civil communities.

And if this were the caſe of the generality of the firſt philoſophers, it may well be preſumed, that the theories they propoſed, and to which their novelty and the authority of the propounders procured a ready aſſent among their unſkilful diſciples, were but narrow and ſuperficial, and far from reaching to the vaſt extent, or penetrating into the hidden receſſes of the nature of things. And though I deny not, that divers of the ſucceeding diſcourſes did from time to time laudably improve the ſtock of knowledge left them by their predeceſſors; yet moſt of their improvements conſiſted rather in commenting upon the writings, or ſentiments of the firſt authors, or making ſome little ſupplements to the very defective ſyſtems of the founders of the doctrines they embraced. So that theſe additions were ſtill made with a great regard to the ſentiments of the founders, or early promoters of theſe doctrines, and not in full endeavours to lay more comprehenſive and ſolid principles, and correct the methods themſelves of philoſophiſing, that were too often erroneous or defective, or both, and on theſe accounts very inſufficient to elevate and enlarge the human underſtanding, which, without their higher improvements, muſt needs remain unfit for the nobler and more abſtracted ſort of metaphyſical ſpeculations.

Euſeb. I AM glad; *Eleutherius*, to find the ſentiments I have long had ſtrengthened by their conformity to yours; for it ſeems to me, that moſt of the heathen philoſophers, and ſeveral whole ſects themſelves, have in their framing their philoſophical principles and tenents, and the natural theology, that was grafted on them, conſidered the more obvious and familiar things, about which they were converſant, ſuch as thoſe corporeal objects, that affect the ſenſes, and others that may be of importance, whether good or bad, to human life and welfare. And I do not wonder, that a philoſophy, that had ſuch a beginning, ſhould participate of the imperfection of its origin, and ſhould not ſufficiently elevate the mind, and qualify it for the contemplation and diſcernment of immaterial ſubſtances and abſtracted beings, which perhaps were ſcarce ſo much as thought of, when the theories, that ſhould reach them as well as other ſubjects, were framed and eſtabliſhed. And it were to be wiſhed, that a great number of Chriſtian philoſophiſers were leſs liable to the like cenſure. But I fear, that almoſt all, that have left us diſcourſes of natural theology, whether after or before the preaching of the goſpel, have given us what, if you will pardon a rude expreſſion, I ſhall venture to call a Creaturian theology; by which I mean a ſyſtem of ſuch definitions, notions, and articles, as has been ſuggeſted by the conſideration of the creatures, and chiefly, if not only, adapted to them, without being large enough to comprehend immmaterial ſubſtances and abſtracted beings, eſpecially God himſelf and his divine perfections, to which probably little or no regard was had in the framing of thoſe ſyſtems.

Eleutherius. PERHAPS, *Euſebius*, it may be opportune enough, to add to what you have been ſaying, that the Peripateticks, whoſe ſect has for many ages afforded the greateſt number of Chriſtian philoſophers, having taken moſt of their ſpeculative doctrines relating to natural theology from their maſter *Ariſtotle*'s metaphyſicks, and partly alſo from his phyſical writings; it need be no wonder, that many, not to ſay moſt of the Ariſtotelian Chriſtians, that have written of natural religion, have given great occaſion to the opinion, that philoſophy and theology are incompatible. For *Ariſtotle* was a Heathen, and deſtitute of divine revelation, which does not only diſcloſe to a well diſpoſed mind truths undiſcoverable by its own mere abilities, but on ſeveral accounts affords much light to divers objects, that, though not quite beyond the ſphere of reaſon, would, without that ſupernatural help, be but dimly diſcerned by it. And I muſt now make bold to ſay, that *Ariſtotle* was not only a Heathen, but was far enough from being one of the beſt of the Heathen philoſphiſers about God and divine things, there being ſeveral of the ancient philoſophers, as *Plato* and *Pythagoras* (to name no others) whoſe diſcourſes about the Deity and its attributes were much more ſound, and leſs unſuitable to that infinitely perfect being, and his actions, than were thoſe of *Ariſtotle*, of whom the excellent *Grotius* ſomewhere judiciouſly obſerves, that his ſentiments appeared much more favourable to religion, in his exoterical writings, where he was to keep fair with popular readers, than in his acroamatical, where he delivers his ſenſe as a philoſopher. And yet the notions of this author, who was ſo ignorant of the principles of true religion, and ſo unfavourable to divers articles of it, has, by his own good, and by the church's bad fortune, had the luck to be for many ages taken for the great guide of Chriſtian, and partly of Jewiſh philoſophiſers. For as I find the juſtly famous *Maimonides*, who has been long acknowledged the moſt learned and judicious of the rabbis, to have been very converſant in *Ariſtotle*'s philoſophy, and (as I could eaſily juſtify, if it were proper, by many of his Peripatetic notions and tenents) was much addicted to it; ſo it is too notorious, that, till the laſt century, the generality of the Literati, among the Chriſtians themſelves, were bred up in a high veneration for *Ariſtotle*'s ſentiments, and entertained them with little leſs than an implicit faith, though ſome of them not only were repugnant to ſeveral truths of the Chriſtian religion, but (as our friend Mr. *B.* has ſomewhere ſhewn) manifeſtly tended to ſubvert the very foundation of natural religion, as far forth as this is grounded on an obligation to love and obey God, as the creator, or at leaſt the immediate author of human nature, and the ſupreme rector of men and their affairs. But this is not a time and place to inlarge upon the ill aſpect, that ſome of *Ariſtotle*'s dogms have upon religion, whether revealed, or even natural; what I have been obliged to mention

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on being but to juſtify the (lately propoſed) conſideration, that ſince the opinions of a Heathen, whoſe notions of God were very obſcure and defective, and divers of them very erroneous too, has had the luck for many ages to be cried up for the oracle of philoſophy, we ought not to be much ſurpriſed, if we find divers ſentiments, commonly received for philoſophical notions and dogms, repugnant to thoſe, which the holy ſcriptures teach as theological truths: nor ought it to diſſettle our minds, that a man, who aſcribed a great deal too much to nature (whoſe works yet he did not throughly underſtand) and nothing to divine revelation, ſhould aſſert, as univerſal axioms, things, that cannot warrantably be extended beyond created beings.

Euſebius. You will, I preſume, *Juſtinus*, allow me to put you in mind, that you lately intimated, that another conſideration ſhould accompany that, which you come from diſcourſing of.

Juſtinus. I did not forget it, *Euſebius*, but was juſt ready to tell you, that ſafely to rely upon divers things, that philoſophers deliver, as definitions or dogms, it ought to appear, that they had clear and duly limited conceptions of the ſubjects, that are treated of, as well as that their notions and dictates are applied but to ſuch ſubjects, as were ſufficiently taken into conſideration, when they were framed.

N. N. To the ſeveral conſiderations or arguments, that have been hitherto diſcourſed of, I muſt now propoſe one reflection, that I think to be of too great moment, in our preſent controverſy, to be either wholly pretermitted, or but ſlightly conſidered.

N. T. Such a preamble gives me ſome impatience to know, what this important reflection is.

N. N. It is in ſhort this, that ſuppoſing, rather than granting, that there are ſome caſes, wherein the dictates of philoſophy, taken even in a large and favourable ſenſe of that name, are repugnant to ſome articles truly grounded on divine revelation; in theſe caſes, I ſay, one may, and ought to diſtinguiſh between human philoſophy, and right reaſon, ſo that a doctrine may be flatly repugnant to the former, and yet be very reconcileable to the latter.

N. T. I am willing to grant, that ſound philoſophy is, as * * * hath favourably deſcribed it, an aggregate, or, if you pleaſe, a ſyſtem of the arts, ſciences, and in ſhort of all the diſciplines, that men have been able to attain to by the natural light of reaſon. But then I muſt alſo repreſent, that mere philoſophy is not the adequate inſtrument of knowledge, nor of equal extent with it. For philoſophy, as ſuch, can furniſh the mind with no knowledge, but that, which is attainable by the light of merely natural reaſon; whereas the mind of man is capable of being endowed with many notices of a ſupernatural order, which it may receive from revelations contained in that book, which is commonly called the Bible.

To this obſervation, whoſe truth is manifeſt enough without farther proof, I ſhall add another, that I take to be no leſs evident; and it is, that, as reaſon is the proper judge of the agreement and diſagreement, as well as of the truth and falſhood of propoſitions and doctrines, ſo the judgments of reaſon are the more or leſs authentick, and fit to be relied on, according as the informations they are grounded on are the more or leſs certain and full. So that thoſe judgments are (at leaſt in compariſon of others) to be looked upon as the judgments of right reaſon, which the rational faculty paſſes, when it is perfectly informed, or at leaſt as fully as it is neceſſary it ſhould be, to enable it to determine rightly in the particular queſtions propoſed to it.

From the two foregoing conſiderations laid together, I preſume, I may infer, that mere human philoſophy is not the adequate ſtandard of human knowledge; and that the boundaries of the former may be much narrower than the limits of the latter; ſince all the knowledge, that mere philoſophy can afford us, has been attained by the mere light of nature, whereas divine revelation is able to furniſh the underſtanding with many ideas and notices of a ſupernatural order, and of great uſe, not only to increaſe our knowledge by diſcoveries wholly new, but, in divers occaſions, to improve our former knowledge; the light of revelation doing to the intellect, what the ſun beams do to the air, which they at once enlighten and expand.

N. N. To ſpeak freely, gentlemen, I look upon philoſophy, even that which is ſound, but as an effect or production of right reaſon, and not the thing itſelf, and therefore not fit to be confounded with it, or as being, or to be looked upon as an adequate ſtandard of truth, or ſo much as of human knowledge, whereby one may ſafely and exactly meaſure the extent of either.

N. T. You may add if you pleaſe, * * * that our philoſophy is ſo little fit to be taken for a ſure and adequate ſtandard of truth, I mean of that knowledge, that is attainable by right reaſon, that we can have no certain and ſtable ſtandard of philoſophy itſelf. For human knowledge, and by conſequence philoſophy but a part of it, muſt not be compared to *Adam*, who was at his full and compleat ſtature at his firſt production, but may be juſtly compared to an ordinary deſcendant of *Adam*, who at his firſt coming into the world is but a babe, and is reduced to paſs through childhood and youth, *&c.* before he arrives at the full ſtate of manhood. So that philoſophy, as well as knowledge, being a growing thing, we can as little take ſtable meaſure of it, as a taylor can take ſuch meaſures of a child of ſeven years old, as will continue to fit him during his whole life.

Since natural philoſophy, or phyſicks, for example, is grounded, or at leaſt ſhould be, upon natural hiſtory, the diſcoveries made in latter ages of the *Eaſt* and *Weſt-Indies*, beſides

many other countries have ſo enlarged the hiſtorical knowledge of the phænomena of nature, and diſcloſed ſo great a number and variety of her productions, that were not known to the Greek and Roman philoſophers, that theſe diſcoveries cannot but have given ground to ſeveral alterations in phyſick. * * *

For my part, I look upon mere philoſophy as a thing much inferior to mere reaſon, and upon mere reaſon as no leſs inferior to right reaſon; for that intellectual faculty we call reaſon, neither needs nor ought to confine itſelf to the dictates of philoſophy, which, as * * * * lately and truly noted, is a production of reaſon, which this faculty by acting freely by the ſame or the like ways with thoſe it made uſe of in framing the diſciplines, that conſtitute philoſophy, and by the help of further notices, with which the new diſcoveries of natural things, that the happy induſtry of the moderns frequently ſupplies it with, may conſiderably both enlarge and correct the philoſophy hitherto received. But all the improvements of this kind being afforded but by natural and human helps, the intellect cannot by them be furniſhed with all the notices it is very capable of receiving, for there are a great many truths and notions of a higher order than natural, which God may (if he pleaſes) in a ſupernatural manner reveal to men, and a conſiderable number of ſuch, we Chriſtians believe he has actually revealed to us in thoſe books we call the holy ſcriptures. Theſe contain ſeveral myſteries and other truths, that human reaſon left to itſelf would never have attained to the knowledge of, eſpecially concerning the peculiar manner of God's exiſting, the nature of ſome of his attributes and decrees, and many things about unbodied ſpirits good and bad, and in a word the peculiar articles, that the Chriſtian theology has added to the natural.

These diſcoveries being ſo new, and ſeveral of them ſo noble, it will ſcarce be denied, but that an intellect, advantaged by the knowledge of them, muſt be (*cæteris paribus*) much better qualified to frame right conceptions, and make juſt eſtimates of ſeveral doctrines relating to philoſophy and divinity, than an intellect not furniſhed with theſe excellent helps. Let me add, gentlemen, that ſince theſe divine patefactions are made to a rational creature, that is indowed with faculties, not only apprehenſive, but diſcurſive, whereby he is able to infer one thing from another, an intellect informed by the ſcriptures may eaſily enough attain to many more notices, than are in thoſe books delivered in expreſs terms, thoſe, that are obtained by legitimate illations, being divine truths, as well as the texts themſelves, when they are clearly deduced. * * * *

Manlius. I know, gentlemen, that it is not very difficult for ſubtil wits to deviſe nice and plauſible diſtinctions, fit to lay a fine varniſh over ſentiments, that are not ſound. But when you have ſaid all that can be ſaid, you muſt confeſs, that one truth cannot contradict another, ſince this is an axiom ſelf-evident, or at leaſt is one of the principal foundations of all our reaſonings; one of the moſt uſual and moſt effectual ways of proving a thing to be falſe, being this, to manifeſt that it is repugnant to ſomewhat, that is acknowledged to be true. Wherefore ſince it is notorious, that philoſophy teaches us many truths, to conclude, that whatever doctrine contradicts any of thoſe truths, though it be propoſed by a divine, and ſtiled a myſtery, is indeed an error, is to diſcourſe as conſonantly to right reaſon as to philoſophy.

Eleuther. It may perhaps, gentlemen, clear the way for an anſwer to this ſpecious objection, if inſtead of employing the diſtinction of the word truth, or terms equivalent, which may be eaſily found in the writings of metaphyſicians, and which may be of good uſe on fit occaſions, I, that have no need of them at this time, venture to propoſe a couple of other diſtinctions, that I think more pertinent to my preſent purpoſe. Give me leave then to repreſent, that a truth, taking the term in a lax ſenſe, may be conſidered either as but gradual, or as compleat. By gradual truths, I mean ſuch propoſitions or doctrines, as even to a good reaſoner appear to be true, whilſt he is furniſhed but with ſuch a degree of light or information, though that be the higheſt he is able to procure: and by compleat truths I mean the judgments, that are duly formed upon a perfect information, or at leaſt ſuch a one, as is ſufficient to ground a right judgment upon. The former member of of this diſtinction * * * * *

The latter member of our firſt diſtinction needs no examples to declare or prove it, and therefore I ſhall proceed to my ſecond diſtinction, which puts a difference between reſpective and probationary truths (ſtill taking that term in a lax ſenſe) and truths, that are abſolute or eternal; this diſtinction of truths may in ſome caſes be coincident with the former; but becauſe there are more caſes, wherein they are not coincident, it may be proper to ſpeak of it ſeparately.

By abſolute truths then (to begin with that member of our diſtinction, becauſe it may be diſpatched in few words) I underſtand in the firſt place thoſe theoretical principles and axioms, which are the foundations of our reaſonings, ſuch as are two contradictories cannot both be true, every thing is, or is not, every line is either ſtrait or crooked, every number (whole and finite) is either even or odd. Two quantities, that are each of them equal to a third, are themſelves equal, and from truth nothing but truth can be legimately deduced. And to this ſort of primary truths may be referred the definitions of our more ſimple mental ideas, ſuch as the clear conceptions we have of a triangle, a ſquare, a circle, a cube, a cylinder, *&c.* And becauſe there neither has, nor will be any time, wherein theſe principles of knowledge and ratiocinations may not be ſafely aſſented to, without any relation to contingent circumſtances, theſe ſelf-evident principles may be called eternal truths; whereas for thoſe of the ſecond member of our laſt diſtinction, though a man

a man may rationally look upon them as truths, as long as he ſees juſt cauſe to believe them, or no ſufficient cauſe to queſtion them, yet he cannot ſafely judge them to be more than truths upon ſuppoſition, or to expreſs it ſhorter, conditional. *N. B.* I call them probationary truths, not only becauſe I am in part authoriſed by the example of our illuſtrious *Verulam*, who gives to ſeveral of his phyſiological rules or theorems the modeſt title of *Canones Mobiles*, but chiefly becauſe I am warranted by the nature of the thing. For there are many doctrines and aſſertions, that for a long time (amounting perhaps to many ages) were generally received by philoſophers themſelves for true, which yet, by the happy diſcoveries of latter times, appear to unprejudiced judges to be errors.

Manlius. I WILL not now, *Eleutherius*, diſpute the inſtances you have alledged, but I expect to hear, how you will apply your diſtinctions to the objection they ſhould enable you to anſwer.

Eleuth. I SHALL immediately endeavour to ſatisfy your expectation, *Manlius*, by repreſenting to you, that ſince ſeveral dogms and aſſertions may be received for truths, by a perſon that reaſons well, according to the beſt information he is able to obtain from mere philoſophy, and yet may, by ſo doing, aſſent to that, which, abſolutely ſpeaking, is an error in the judgment of right reaſon, that is, of reaſon fully or competently informed; and ſince alſo what I have now aſſerted holds true as to many things, that are judged to be within the ſphere and juriſdiction of mere philoſophy; it ſeems very rational to think, that divers theological dogms may be rejected, and perhaps too oppugned, by a man, that judges as a mere philoſopher; which yet may be aſſented to by a Chriſtian, without at all acting unconformably to right reaſon. For nothing can be more rational, than to believe that to be true, which is taught by God, who can neither be himſelf deceived, nor deceive us.

Euſeb. YOU will, I hope, *Eleutherius*, permit me to add, that ſince many doctrines are expreſsly delivered in the ſacred books, which human philoſophy could never have taught us, I think you may, at leaſt as to theſe truths, turn the latter part of *Manlius*'s objection upon himſelf; for if one truth cannot be contradictory to another, we have more reaſon to believe thoſe theological truths, that are delivered in the holy ſcriptures, and conſequently recommended by divine authority, than the philoſophical dogms, that thwart them; ſince as it is oftentimes more eaſy to underſtand the words of God clearly ſet down in the inſpired books, than the voice of nature, which her interpreters do frequently miſtake themſelves, and not ſeldom deliver, but darkly, or unſincerely unto us: ſo when philoſophy and the ſcripture ſeem to diſagree, it is always the ſafeſt courſe to believe what is taught by God, whoſe exact veracity is included in his moſt perfect nature, who poſſeſſes an intellect, not only of a ſuperior order to ours, but truly omniſcient, and who does moſt clearly know, not only all gradual verities, and all thoſe, that are but conditional truths, or grounded upon ſuppoſitions, but all the complete, abſolute and eternal truths, that our philoſophy and reaſonings are built on: and moſt probably, many more, neither attained, nor ſo much as attainable, by natural reaſon; though never ſo well improved by merely human philoſophy.

Eleuth. THE mention, which *Euſebius* has made of the differing orders of intellects, and the immenſe ſuperiority of God's underſtanding above man's, ſeems to me very pertinent to our diſquiſition, ſince the divine intellect being omniſcient, can at once look through the whole aggregate of things knowable, and have a perfect proſpect of all truths, both ſingly, and in their connexion, dependency, and (in a word) their entire ſyſtem: upon which account it is reaſonable to ſuppoſe, that ſome things may be irreconcilable in our underſtandings, that are not ſo in God's.

FOR I have more than once obſerved, that as there are ſome contradictions, that appear plainly to be ſuch, by a clear and direct view of the rational faculty, ſo there are others (though not ſo many) whoſe contrariety, though it be thought manifeſt of it ſelf, yet really, as it ſtands in our judgment, is a work or effect of the rational faculty; not as it is barely apprehenſive, but as it is diſcuſſive. For ſometimes in framing a judgment, that certain things are contradictory, we make a ſuppoſition, or an inference, or perhaps both, though becauſe we are wont to paſs judgments in the like caſes very eaſily, and without heſitancy, we are not uſually aware, that we do ſo, but preſume, that our judgment is grounded only upon a clear view of a manifeſt repugnancy between the things collated. Now it is very poſſible, that the ſuppoſition or the illation, that we make uſe of in judging two things to be contradictory, may be erroneous, and that an intellect, that has far more light and penetration than ours, may diſcern that weakneſs in the grounds of our judgment, that we did not ſuſpect. And this I am the more perſuaded of, becauſe, even in affairs merely phyſical, many things are judged to be contrary to the true laws or dictates of right reaſon; becauſe men do either preſume ſomething to be manifeſtly true, that is not ſo, or do not know, or perhaps ſo much as ſuſpect, the differing ways, by which a thing may be produced, or brought to paſs, or may have a right to the title of true. * * *

Manlius. I HOPE, gentlemen, that notwithſtanding all you have ſaid in derogation of philoſophy, you do not mean to reject its authority univerſally; as if in no caſes it may be employed as a norma, or rule, according to which we may ſafely judge of divine things. For unleſs you grant ſome fundamental and eternal truths, I ſee not how it is poſſible for us to confute divers theological errors of Pagans and other infidels, whoſe rejection of the authority of the ſcriptures does not allow us, without indiſcretion, to impugn them with arguments from thence. To which I may add.

Eleuth.

Eleuth. —— I PRESUME, *Manlius*, that you will not think your additions necessary, when I shall have acquainted you with my thoughts, which I doubt not are agreeable to these gentlemen's too, about the matter under consideration. I conceive then, that there are two kinds or orders of principles and dictates of reason; the one comprises those primary and universal notices and axioms, that are applicable to all kinds of subjects; such as are the first metaphysical and mathematical verities, as that "contradictories cannot both be "true, *non entis nulla sunt accidentia*; the "whole is greater than a part of it; if to "equal quantities equal quantities be added, "the totals also will be equal; every line is "strait or cooked; from truth nothing but "truth can be legitimately inferred." These and the like self-evident principles hold on all occasions; and therefore may be distinguished from other rules or dictates of philosophy, which, though they will hold in most cases, do not hold in all cases, and are, on that account, subordinate, or at least of an inferior nature, to the primary and catholick principles lately mentioned.

Now to apply this to our present purpose, if the philosophical dogm, that seems repugnant to the holy scriptures, be grounded upon a truth, that is but of an inferior order, I shall, to avoid repetition, refer the consideration of this case to those passages of this present conference, that may be pertinently applied to it: especially if the philosophical tenet concern a subject, which natural reason ought to discern herself to be an incompetent judge of, at least, as she is at present informed.

Manlius. BUT what if a text of scripture be repugnant to a dogm in philosophy, that is grounded upon one of those metaphysical or mathematical axioms, that you mention, as verities of the highest order? Must you not, in that case, confess, both that philosophy and theology may contradict each other; and that, without bidding defiance to reason, we cannot forbear to embrace that philosophical dogm, that is built upon the first and highest principles of reason?

Eleuth. IN answer to this weighty objection, I must advertise you, that I look upon the metaphysical and mathematical principles, we have been speaking of, to be truths of a transcendent kind, that do not properly, and exclusively to the other, belong either to philosophy or theology; but are universal foundations, and instruments of all the knowledge we mortals can acquire.

THAT part of the metaphysicks, that treats of universal and immutable truths, is far superior to, and ought to be distinguished from, that which applies those catholick rules and primary notions to particular, or at least to determinate subjects. The first sort of truths are not to be denied or rejected, upon the account of an alledged revelation, because they are the principles, upon which, or with congruity to them, our assent to that revelation it self, if it be a true one, must be grounded; and therefore the texts, supposed to contain that revelation, must be so interpreted, as not to contradict those principles. For God, being infinitely knowing, and being the author of our reason, cannot be supposed to oblige us to believe contradictions: and since truth cannot be repugnant to truth, we can easily be much more sure, that such a metaphysical principle is true, than that a sense contrary to it can be the true meaning of the divine author: as men of every sect acknowledge, in effect, by the answers and expositions they are fain to adjust to divers passages, where things are delivered in popular expressions, and not suitable to exact truths in astronomy, geography, *&c.*

IN answer to the fourth objection it was said,

1. THAT a proposition may be contrary to this or that particular philosophy, as the Epicurean, Peripatetick, *&c.* without being contrary to philosophy in general.

2. THAT a proposition may be contrary to all the several sects of philosophers now in repute, without being contrary to true philosophy.

3. THAT it is one thing to contradict the articles or sentiments of this or that church, and *(à fortiori)* of this or that school, or particular divine; and another thing, to contradict an article of faith, really delivered in the scripture.

4. THERE are divers occasions, on which theology and philosophy seem to contradict each other, only because men do not sufficiently know, or else do overlook the requisites of a true contradiction.

5. THAT a theorem or dictate of philosophy cannot be safely relied on, if either it be not clearly understood, or if it be applied to things, for which it was not made, or is not proper.

6. THAT a thing may be contrary to philosophy, as founded merely in the light of nature, without being contrary to right reason, taken in its full extent.

7. THAT the foregoing truths being admitted, there is not any thing in the Christian Religion, that does really contradict any principle of right reason; if the principle be sound, and the article rightly proposed, and duly grounded on scripture, well interpreted.

OCCASIONAL THOUGHTS.

IT is a sad, as well as shameful thing to consider, that the intellect of man, which should be so capacious and so unbiassed a faculty, is so far from being so in effect, that most men have a local motion (if I may so speak) and a great many have a Sectarian reason, and others a mercenary one. Thus usually, such as are born in such a place, espouse the opinions true or false, that obtain there; as those, that are born in *Arabia*, are generally Mahometans; and those, that are born in *Spain*, are generally (and many of them perhaps upon not much better grounds) Christians

tians and catholicks. And ſo the Jeſuits diſperſed all the world over uſually maintain ſome opinions about the helps of grace, and the Dominicans quite oppoſite ones. In *Italy* the pope's infallibility and power over kings are generally maintained, which are heterodox tenets in *France*, eſpecially at the Sorbonne. And the abſolute authority of princes is defended in ſome monarchies, as generally by mercenary pens, or other unbiaſſed writers, as it is oppoſed in divers other countries by perſons, ſome of whom, it is to be feared, are ſwayed by the ſame motives of intereſt or hope, to maintain ſentiments quite oppoſite to thoſe.

If revealed theology obliges us to believe things incomprehenſible, or above reaſon, natural theology does the like.

Infinity can be but figuratively affirmed of God's perfections; but yet they may well be called infinite, becauſe they are boundleſs, which is all the infinity they are capable of: and God being the firſt cauſe, hath not only perfections abſolutely ſo called, that exclude a greater or an equal perfection, but poſſeſs alſo all the poſſible degrees, as well as kinds, of true perfection, *&c.*

We men cannot conceive or explain, either by example, or any thing truly analogical, how God can create either matter or a human ſoul, *&c.*

We know ſo few properties and analogies of *infinitum*, that, when we apply to it the rules or meaſures, that were made to finite things, we are ſubject to make very defective reaſonings, and leave the queſtion obſcure, becauſe the object is ſo; and the clear data we have are inſufficient to enlighten it.

I do not think my ſelf obliged to have the ſame regard, and reſpect for the explications, that the ſchoolmen and many other divines give us of the myſteries of Chriſtianity, that I have for the articles themſelves; ſince for the myſteries I have the divine authority of the revealer, who can oblige my faith to aſſent even to dark truths; but for the expoſitions and conſequences, I have but human authority: and though clearneſs is not always neceſſary to divine myſteries, yet it may be juſtly exacted in a good explication, ſince to explicate a thing, is to render it at leaſt intelligible.

Sometimes reaſon ſignifies the ſuperior faculty of the mind, furniſhed with its own original notions and axioms, and with vulgar or popular notices; and ſometimes it is uſed to ſignify a kind of organical thing; and is conſidered not as a faculty acting immediately upon her own ſtock of congenite truths, and of vulgar notices, but as ſhe manages a frame or ſyſtem of ideas and propoſitions, wherewith ſhe is furniſhed by ſciences and arts; which, though as it were tools or inſtruments of her own framing, yet are ſuch, as being once made, her operations are regulated by them; as when the eye and the hand make rulers, compaſſes, and teleſcopes; but are afterwards in their operations guided, as well as aſſiſted by theſe inſtruments; and ſuch inſtruments I take the liberal diſciplines (under which name, for brevity ſake, I compriſe both arts and ſciences) to be in reference to the mind; and the intellect and rational faculty, informed by theſe diſciplines, and judging according to their informations, I think we may call philoſophical (or merely natural) reaſon. Beſides theſe two acceptions of the word reaſon, there may be alſo a third; in which, as in the laſt named, ſhe is conſidered as acting organically, but yet with a more noble and comprehenſive organ or inſtrument. For the reaſon of man, beſides the utmoſt information, ſhe is able to give herſelf by the mere light of nature, is capable of receiving a higher and more excellent information, by ſupernatural diſcoveries or revelations.

Though reaſon eſſentially conſidered is the ſame in ſpeculations of all kinds, yet organically conſidered, or as acting in and by ſuch notions and other inſtruments, ſhe is a more limited and a leſs catholick agent, in reference to ſome kinds of objects; and muſt make uſe of other notions and inſtruments, when ſhe is converſant about them: as ſhe muſt have one ſet of notions for infinite, and another for finite things, and alſo one for things ſtable or permanent, and another for things of a ſucceſſive nature, as time, ſtreams, flame, *&c.*

Right reaſon may be looked upon as a catholick principle, of which philoſophy is but an application, and the dictates of particular philoſophies, ſuch as the Peripatetick, the Platonick, the Epicurean, *&c.* are but particular corollaries, which are not always truly drawn, and on that account may always be queſtioned or examined, and may, I fear, oftentimes be juſtly rejected; and this holds, eſpecially, when, in the examen, he that makes it is aſſiſted by the diſcoveries made by revelation, from whoſe heavenly light, in reference to divers ſubjects, the intellect may receive ſuch a benefit, as the air does in a clear day from the beams of the ſun, by which it is both enlightened and expanded.

It is one thing to contradict a catholick or metaphyſical principle, or dictate of reaſon, and another to contradict a phyſical one; ſince the laws of nature, as they were at firſt arbitrarily inſtituted by God, ſo, in reference to him, they are but arbitrary ſtill.

Theology, or revealed religion, never obliges us to forſake (much leſs renounce) the dictates of reaſon, conſidered in its full extent, as it is a comprehenſion of true notions or propoſitions, both univerſal and particular. For the primary and moſt catholick laws or rules of reaſon are never to be forſaken, upon any occaſion; ſince their truth is ſuppoſed in the beſt arguments, that can be brought for revelation itſelf: and no particular truth can be made out, which, if peruſed home, cannot be at laſt reſolved into, or reduced to, one of thoſe primary and general truths. And therefore if any other dogma be propoſed as a truth (as for inſtance, ſome [that is propoſed as a] revealed article of the Chriſtian religion) if the article be clearly evinced to be divinely revealed, to embrace [aſſent to] it, is not to act againſt

againſt reaſon. For this will teach us to interpret the words, that expreſs the revelation, ſo as not to contradict any primary and catholick rule of reaſon. And if the article be contrary but to ſome ſubordinate dictate of reaſon, or to ſome gradual truth, then alſo we may embrace it without forſaking right reaſon. For her own catholick dictates determine, both that there are ſome things above our comprehenſion revealable by God; and that a propoſition inferred from a ſubordinate [or inferior] rule, or dictate, may be judged falſe, when another medium of probation, as experience or divine teſtimony, that is of a ſtronger, or of a higher order, ſhall manifeſt the contrary [to be true.]

REASON has two uſes, upon which two differing ſignifications of it have been founded. And theſe ought to be carefully diſtinguiſhed, becauſe the promiſcuous uſe of them has bred confuſion in the actions and reaſonings of many. For ſometimes it is to be conſidered as a norma, a rule, or a ſtandard, whereto we apply ratiocinations, *&c.* to judge of their validity or erroneouſneſs. And ſometimes alſo it is conſidered as a principle, by which notions and axioms, and even the norma above ſpoken of, may be framed, on which account it is ſometimes looked on as the rational faculty itſelf, that may act antecedently to what we call a norma.

THE proper duty and office of reaſon is not to teach us ſupernatural things; but firſt to lead us to a ſupernatural teacher, that is, to God; and next to defend the things he teaches againſt the unjuſt imputation of being contradictious or impoſſible: and this latter office of reaſon would not be neceſſary (ſince the teacher is ſuppoſed infallible) but becauſe it is ſo, to maintain, that we do not miſapprehend the meaning of what we receive as taught by him, which muſt be a miſtake of ours, if he, that cannot miſtake or deceive, is ſaid to have taught what is impoſſible to be true.

REASON herſelf commands us to believe ſenſe in divers caſes, againſt what would otherwiſe be rational, *&c.*

THOSE, that think their own reaſon, becauſe it can raiſe them a little above other men, can enable them to ſoar into heaven, and without the aſſiſtance of revelation diſcover the ſublimeſt truths of religion, fall as much ſhort of their deſign, as flying fiſhes do, whoſe wings (or broad fins) do indeed enable them to riſe above other fiſhes, and fly a while in the air, but are able to carry them to no great height, nor keep them long from deſcending again.

BOTH philoſophical and revealed truths proceed equally (though not ſo directly the one as the other) from the ſame Father of lights; as we receive from the ſun, not only thoſe immediate beams, that come in ſtrait lines to us in a clear day, but that light of his, which is reflected to the earth in a moonſhine night.

TRUE philoſophy being but reaſon improved by meditation, conferences, obſervations, and experiments, and the arts and diſciplines produced by them; thoſe things, that may be ſaid of the conſiſtency of reaſon with theology, and its uſefulneſs to it, may juſtly be applied to the friendly agreement of true philoſophy and divinity, and to the utilities of, the former to the latter.

PHILOSOPHY does for the moſt part but more clearly diſplay and expoſe the object; but divine revelation aſſiſted by divine grace may ſerve both for a light, a teleſcope, and a collyrium; ſince it both illuſtrates the object, and furniſhes the beholder with an excellent inſtrument of diſcovery, and clears the eye or viſive faculty from thoſe diſtempers, that render it unfit to exerciſe the beſt and difficulteſt acts of viſion.

DIVINE revelation, when it is made known, being part of the rule of right reaſon, cannot be contrary to it.

REASON might ſeem to be an unkind gift of heaven, in caſe inquiſitiveneſs into matters of religion, if it be exerciſed with ſincerity, diligence, and humility, were either ſo criminal or ſo dangerous, as many think it; and if it were forbidden to exerciſe itſelf upon the nobleſt and moſt important objects it can contemplate.

THOUGH no truth can really contradict another truth, yet that, which is but a gradual truth, may not by us be reconcileable to a ſuperior and abſolute truth. And in that caſe we need not deſtroy a dictate of reaſon, but only give it a limitation, and reſtrain it to thoſe ſorts of things, on which it was at firſt grounded, and to which it was, becauſe of men's ignorance or inconſiderateneſs, that it was not confined.

THEY will often miſs of truth, that ſeek for it with other aims than thoſe of finding and uſing it.

As a good fruit tree being grafted upon a crab or thorn, the wild plant is enabled to bear a fruit much nobler than that, which is properly its own; and on the other ſide the graft proſpers better, than if it grew immediately out of the ground: ſo when theology is as it were grafted upon human learning, it both proſpers better itſelf, and makes the ſtock bear better than its own natural fruits.

Advertiſement of the author's concerning ſome papers belonging to the ſecond part of the Chriſtian Virtuoſo, (*which will in ſome meaſure account for the defects and diſorder of the following diſcourſe,*) probably ſent to his friend *H. O.* Eſq;

ACCORDING to the menace I made you, without being at all diſcouraged by you to execute it, I ſend you a collection of fragments to put in order, which your dexterity and kindneſs will, I know, make as good as the particulars, which are not capable of an exact method, can bear. Perhaps it may ſomewhat apologize for their being ſo confuſed, and alſo afford you ſome aſſiſtance, though but a ſmall one, to range and diſpoſe theſe ſhuffled papers, if I acquaint you with what it was, that occaſioned the diſorder you find theſe fragments in.

* * * * To ſhun which inconvenience, as I committed moſt of my thoughts to looſe leaves or leſſer portions of paper, ſometimes according as they came into my mind, and often as I preſumed I might have more or leſs time to commit things to writing. Even in theſe papers I was ſometimes, by the ſudden forerunners, or actual coming in of company, obliged either to break off abruptly before I had finiſhed what I had to ſay, or to cloſe it very haſtily, and give the laſt part of it a more contracted form, than it ought to have had; that I might timely enough diſpatch it, and in theſe looſe ſnips of paper not having often, much leſs always, when I was writing one, the others already written, to caſt my eye upon. I could not give them the form of parts or portions of a coherent diſcourſe, but was fain to ſet each of them down, as a ſeparate ſentence, or a compariſon, or an argument independent from the reſt, only caſting them into little bundles, as I thought them the moſt referable to this, or that part of the main ſubject. * * *

THESE things may give you ſome account, how theſe papers come to you ſo diſordered, and why I rather wiſh than expect, that you ſhould give yourſelf the trouble, by tranſpoſitions of ſome, and retrenchments in others, to link them into a coherent diſcourſe; but yet I hope ſo dextrous a perſon, as you, will be pleaſed to lay them in that order, that you ſhall think the moſt natural, and the leaſt remote from that they ſhould have been writ in; ſelecting out of the other papers what you think may be not unuſefully added in the margin to illuſtrate or corroborate the paſſage it is affixed to; and if among the adventitious papers, whoſe pertinency, I newly told you, I had not time to conſider, you find any long ones worth referring, they may, if you think fit, be annexed at the end by way of annotations, on this or that paſſage of the foregoing collection.

THE CHRISTIAN VIRTUOSO.

The SECOND PART.

I HOPE the paſt diſcourſe has perſuaded you, that a man addicted to experience, may, by being ſo, have ſome peculiar advantages to be convinced of the truth of the Chriſtian religion. Wherefore it now remains to be manifeſted, that the ſame perſon may have alſo great diſpoſitions to embrace the practice of it. * *

AND, for my part, when I am employed about the duties and functions of a Chriſtian, methinks I do not much recede from my old practice; and that I am ſtill but *trying an experiment*, namely this; *Whether by conſtantly endeavouring to lead a Chriſtian Life, and perform the condition of the goſpel, a man may obtain peace of conſcience and contentment of mind in this life, and endleſs felicity in the next.* * *

As I preſume you do not expect, that I ſhould particularly treat of all the ſeveral things, that may be pertinent to my preſent ſubject, I ſhall confine my diſcourſe to thoſe main things, that may be conveniently referred to the ſix following heads, or propoſitions.

The ſix heads or propoſitions, viz.

I. THAT an experimental knowledge of God's wiſdom, and other attributes, diſcoverable in his viſible works, is a great help to rational piety and devotion.

II. FOR a man's own experience may diſcover unto him the excellency, ſatisfactorineſs, and the advantageouſneſs of thoſe graces and virtues, that are recommended by Chriſtianity.

III. THAT perſonal experience may convince a man of the evils of differing kinds, that attend a vicious courſe of life, and even particular ſins, and of the reſiſtibleneſs of temptations to them.

IV. THAT the ſame kind of experience may aſſure him of the practical poſſibility of performing the duties and functions of a Chriſtian, by the help of thoſe aſſiſtances, that God gives the faithful implorers, to enable them to obey and pleaſe him.

V. THAT both a man's own, and other mens experience, may oblige his aſſent to the truth of what the ſcripture teacheth of the good and bad eſtate of the pious and the wicked.

VI. THAT heedful obſervations may ſatisfy a man of the vanity of the world, and the tranſitorineſs of external, and eſpecially ſinful engagements, and of the emptineſs of thoſe things, for which men refuſe the ways of piety and virtue.

IN the firſt propoſition are two ſections, the firſt ſection conſiſts of four parts, and ſhews the uſe, that the Chriſtian Virtuoſo may make of the contemplation of the *Macrocoſm*, and eſpecially of the later diſcoveries made in the *cæleſtial* part of it. As 1. The order, ſubſtance, magnitudes, diſtances and motions of the ſtars, particularly the planets, primary and ſecondary; and among them the earth and the ſea, by no means forgetting the commodious ſituation and motions of the ſun. Sect. I. Sub-ſect. (1.)

2. Thoſe bodies, that are called *elementary*, which together with the cœleſtial are commonly thought to make up the ſyſtem of the world. Sub-ſect. (2.)

3. Inanimate minerals, ſuch as metals, gems, and the loadſtone, to which third head belong glaſs and other artificial bodies. Sub-ſect. (3.)

4. *Bodies*, that are called *living* ones, ſuch as plants and brutes; whether quadrupeds, birds, fiſhes, inſects or reptiles, and bodies, which partake of both natures, ſuch as zoophytes, lythodendrons. Sub-ſect. (4.)

II. THE ſecond ſection ſhews the religious uſe a Chriſtian *Virtuoſo* may make of the contemplation of the *Microcoſm*, which conſiſts of four parts. The 1ſt relates to the anatomy of a dead human body, and the mechaniſm of a living one. Sub-ſect. (1.)

The 2d relates to the human mind or rational ſoul, and the faculties and powers it has within itſelf, as belonging to its own diſtinct nature. Sub-ſect. (2.)

And the 3d relates to a man, as he is a being integrated by a human mind and living body, ſtrictly aſſociated by certain laws of union or conſociation, eſtabliſhed by God in this monadical creature. To which ſub-ſections there are joined fourthly ſome applicatory reflections on the whole. Sub-ſect. (3.) Sub-ſect. (4.)

The firſt PROPOSITION.

That *an experimental knowledge of God's wiſdom and other attributes diſcoverable in his viſible works, is a great help to rational piety and devotion.*

NATURAL religion, as it is the firſt, that is embraced by the mind, ſo it is the foundation, upon which revealed religion ought to be ſuperſtructed, and is as it were the ſtock, upon which Chriſtianity muſt be ingrafted. For though I readily acknowledge natural religion to be *inſufficient*, yet I think it very *neceſſary*. It will be to little purpoſe to preſs an infidel with arguments drawn from the

the worthineſs, that appears in the Chriſtian doctrine to have been revealed by God, and from the miracles its firſt preachers wrought to confirm it; if the unbeliever be not already perſuaded, upon the account of natural religion, that *there is a God*; that *he is a rewarder of them that diligently ſeek him*; and that he has ſome attributes, as juſtice, mercy, wiſdom, &c. to which the Chriſtian doctrine is very congruous; and to which (attributes) it were highly incongruous, that he ſhould ſet his ſeal of miraculous power, to authoriſe a doctrine falſly pretending to be promulgated to mankind by his command.

But that natural religion is highly ſerviceable, if not alſo neceſſary, to that of Chriſtians, I have endeavoured to manifeſt partly in the foregoing part of this paper, and more ſolemnly in another diſcourſe. And therefore remitting you to that for further proof, in caſe you think it needful, I ſhall proceed to obſerve, that the chief argument, which engaged the heathen philoſophers, and other men of parts, to exerciſe the nobler acts of natural religion, by *admiring*, *thanking*, and *praiſing* the deity, was ſuggeſted to them by the knowledge and conſideration of the macrocoſm and microcoſm, that is, (to uſe a more familiar and yet equivalent expreſſion) the univerſe and man. And to the attainment of this knowledge, and to the making of the reflections, that naturally accompany it, the experimental philoſopher has divers conſiderable advantages (and diſpoſitions:) becauſe his way of converſing with the works of nature does both oblige and accuſtom him to conſider them very heedfully; *to* view them round about; *to* take many of them to pieces; *to* look upon them in their ſeveral capacities (if I may ſo ſpeak;) and in ſhort, *to* inveſtigate their properties by the help of all thoſe ſciences and arts, that may help us to diſcover them.

God having made the world with intention, not only to *communicate*, but to *expreſs* his goodneſs, and diſplay ſome other of his attributes, as his divine power and wiſdom; he hath been pleaſed ſo to frame this great machine of the world, that in *ſome* parts of it, the impreſſes of thoſe divine perfections are *ſo manifeſt*, if not *conſpicuous*, that to uſe a ſcriptural phraſe, he that *runs may read them*; and a ſlight attention and ſuperficial conſideration may ſuffice to make them be taken notice of. But there are other things in the fabrick of an engine, as exquiſite as it is vaſt, (ſuch as the world, and the creatures that make it up) the ſymmetry of whoſe parts, and the curiouſneſs of whoſe ſtructures, cannot be diſcerned, but by a very attentive and intelligent contemplator, furniſhed with conſiderable ſkill in mathematicks, phyſicks, anatomy, opticks, and divers other diſciplines. And though even theſe will not enable a man to diſcover *all* the curioſity, that God hath employed in the contrivance of his admirable works; yet ſtill he, that conſiders them with the moſt fixed and piercing eyes, will diſcover *more and more* of that exquiſiteneſs, in proportion to the meaſure of his attention and philoſophical knowledge; as when men ſail in in the midſt of the ocean, though none of them are ſo quick ſighted, as to be able to ſee any ſhore, or look into the bottom of the ſea; yet ſome men will ſee farther and deeper than others, according as they look more earneſtly, and have better eyes.

There are divers accounts, wherein the curioſity of a Chriſtian Virtuoſo may be made ſerviceable to his piety. But in compliance with my intended brevity, I ſhall pitch but upon one of them, which is the ſtudy, that, as an experimental philoſopher, he concerns himſelf to make of the macrocoſm and microcoſm; as I, to comply with new received forms of ſpeech, ſhall often ſtile the world and man. About each of which objects of his contemplation, I ſhall, though but very briefly, ſet down ſome obſervations in a pecular ſection.

SECTION I.

Shewing the uſe the Chriſtian Virtuoſo may make of the macrocoſm, conſiſts of four parts or ſub-ſections.

(1.) Of the order, ſubſtance, magnitudes, diſtances and motions of the ſtars, particularly the planets, primary and ſecondary, and among them the earth and the ſea, not forgetting the commodious ſituation and motions of the ſun.

(2.) Of thoſe bodies, that are called elementary; which, together with the celeſtial, are commonly thought to make up the ſyſtem of the world.

(3.) Of inanimate minerals, ſuch as metals, gems, and the loadſtone; to which third head belong glaſs and other artificial bodies.

(4.) Of bodies called *living* ones, ſuch as plants and brutes, whether quadrupeds, birds, fiſhes, inſects or reptiles, and bodies, which partake of both natures, as *Zoophytes*, *Lythodendrons*.

The diſcoveries of the modern *Virtuoſi* do not only repreſent the æthereal part of the world conſidered in itſelf, as a body incomparably more vaſt than it was wont to be thought, but they likewiſe manifeſt, that the cœleſtial lights, that adorn it, are very much more numerous, than former philoſophers and aſtronomers took them to be. For, according to the vulgar computation, there are but ſeven planets, reckoning the *Sun* (who yet ſeems to be rather a fixed ſtar) for one, and a thouſand twenty odd firmamentary ſtars. But *Galilæo* detected four new planets, that move in diſtinct orbs about *Jupiter*; and ſince him divers others (for the preciſe number is not fully agreed on) have been added, belonging to *Saturn*. And as for the fixed ſtars, our glaſſes have diſcovered multitudes of them unobſerved by the ancients; the *Pleiades*, for inſtance, that formerly were ſuppoſed to contain ſeven ſtars, (though now many obſervers affirm they can ſee but ſix) have been diſcovered to be a conſtellation, whereto a ſurpriſing number of

formerly inconſpicuous ſtars may be referred. The *galaxy* or *milky way*, which vulgar philoſophers would have to be but a meteor, is by our better tubes diſcovered to be a diffuſed aggregate of ſingly undiſcernible ſtars, whoſe number is ſcarce credible. And I little doubt, but that, if our glaſſes ſhall be further improved, there will be ſtill more and more numerous ſtars detected, to increaſe the number of thoſe, that are ſo already; which I am the rather induced to think, becauſe, having for a time been furniſhed with a teleſcope, which perhaps not two in Europe exceeded, and taking great pleaſure, in a ſerene and dark night, to look upon the *belt* or *girdle of Orion*, and ſome of thoſe whitiſh plaſhes of the ſky, that are called *Nubiloſæ*, I could ſcarce turn my tube to any part, where I did not make a ſurpriſing diſcovery of I know not how many little ſtars I had not ſeen before; and thoſe too had ſuch an appearance, as invited me to think, that I might have ſeen a great many more, if the teleſcope (which was ſoon after ſtoln from me) had been as perfect a one, as I had then hopes to procure.

THE ideas, that the modern virtuoſi are, partly by their teleſcopes, and partly by their *hypotheſes*, aſſiſted to frame of the magnitude of the celeſtial part of the world, repreſent it very much more vaſt, than vulgar philoſophers and aſtronomers have thought it to be. For *though* later artiſts, that have employed better inſtruments, and made more accurate obſervations, teach, both that the terreſtrial globe is more in compaſs by ſome thouſands of miles, than it has hitherto been computed to be; and yet that the ſun is many more times than one hundred ſixty ſix times (which is the received eſtimate of his bigneſs) greater than the earth; inſomuch that that juſtly famous and accurate obſerver Signior *Caſſini* extends its magnitude ſo far, as to make it exceed ſome thouſands of times that of the terreſtrial globe, from which, though the ſun be eſteemed at a moderate diſtance, to be removed 1165 ſemi-diameters of the earth, each of which the learned aſtronomer *Gaſſendus* computes to be 4177 miles, ſo that the whole diſtance amounts to 4866205: *yet*, according to the Copernican hypotheſis, embraced by the greateſt part by far of the modern virtuoſi, *as* other aſtronomers are content to teach, that the globe of the earth is but as it were a phyſical point in reſpect of the firmament, *ſo* the Copernicans aſſert, that the great orb itſelf (as they call that, wherein the earth annually moves about the ſun) to be no more but a phyſical point in regard of the firmament; ſince the fixed ſtars appear of the ſame magnitude, even to mathematical obſervers, whether they be looked upon, when the earth is betwixt the ſun and them, or when the earth is in an oppoſite ſituation, and has the ſun between them and it. But without laying the whole ſtreſs of our argument upon *hypotheſes*, it is plain, that by good teleſcopes, we may diſcover in the eighth heaven many hundreds of fixed ſtars, that the ancients never ſaw there, nor are to be found on the vulgar cœleſtial globes. And for ought we know, the ſmallneſs, that many of theſe ſtars appear to have, may proceed but from their being at a greater diſtance from us, than thoſe commonly taken notice of. For to ſay with vulgar philoſophers, that all the fixed ſtars are in the ſame ſphere, and equally removed from the earth, being like nails faſtened in a piece of wood, is precarious, and to them that are convinced, by the motions of cœleſtial comets and other proofs, of the fluidity of the upper part of the univerſe, improbable. And indeed if we conſider, that, as I among others, have more than once had occaſion to obſerve, as our teleſcopes come to be more and more improved, ſo we diſcover more and more ſtars in what we call the firmament; it will be difficult for us men to know, to what extent the vaſtneſs of the univerſe may not reach: which conſideration may naturally enough *both* give a *Virtuoſo* far more large ideas or conceptions than men commonly have of his greatneſs, who is able to make a fabrick, that is ſo ſtupendouſly vaſt; *and* oblige him to give a full aſſent to that of the Pſalmiſt, *Great is the Lord, and greatly to be praiſed, and his greatneſs is unſearchable* *. * Pſalm cxlv. 3.

THE wiſdom of God in the ſyſtem of the heavens, and their various and yet regular motions, is ſo conſpicuous, that in almoſt all ages and nations, the conſideration of the cœleſtial bodies has led the contemplators of them, to aſcribe them to a divine author or moderator. And indeed, as the miraculous ſtar led the Eaſtern ſages to the ſon of God, ſo the natural ſtars of heaven were the chief lights and guides, that led the heathen philoſophers to the acknowledgment and worſhip of God. About which there is an excellent teſtimony of *Ariſtotle* preſerved us, if I miſtake not, by *Cicero*. Wherefore ſince divers even of the heathen philoſophers made it unneceſſary for me to enlarge upon this ſubject, I ſhall content myſelf to offer you a couple of ſhort remarks or advertiſements about it.

THE firſt of theſe ſhall be this; that you need not be kept from acknowledging the wiſdom of God, in the frame and conduct of the cœleſtial bodies, by the differing *Hypotheſes* of aſtronomers about their order and motions. For it is not upon the truth of this or that particular explication of the cœleſtial *Phænomena*, but upon the conſideration of the *Phænomena* themſelves, that the perſuaſion we have of the divine wiſdom is grounded, or at leaſt needs to be ſo. For, *whether* you ſuppoſe, with the *Pythagoreans* add divers ancients (mentioned by *Ariſtotle* and others) whoſe opinion has in later times been revived by *Copernicus*, that the ſun is in the middle of our world, and the earth as well as other planets move about it; *or* that, with *Ptolemy* and the generality of aſtronomers, who would have the earth to remain unmoved, and all the planets and fixed ſtars to perform their courſes about it, as the phyſicial centre of their motions; or *whether* you will with *Tycho* and his followers, prefer an *Hypotheſis* differing from each of the others, and yet partaking of both:

both: which ſoever, I ſay, of theſe and the like theories is the beſt, yet all agree in this, that the motions of the heavenly lights are divers of them ſcarce conceivably ſwift, and, notwithſtanding their variety, have an admirable regularity, which has laſted, for ought appears, as long as the world, and is like to perſevere to the end of it; which made *Ariſtotle*, who was ſeldom too forward to have recourſe to divine beings, think it neceſſary to aſcribe ſo great a regularity and harmoniouſneſs in the incredibly ſwift motions of ſuch vaſt bodies, to the agency and conduct of diſtinct intelligences, preſiding over the diſtinct cœleſtial ſpheres; wherein he did not much deviate from divers other heathen philoſophers, who were therein followed by whole ſects, and ſome of them by nations, that, as I have elſewhere ſhown, thought each planet to harbour, and be guided by, not only a rational, but a divine being. So that, as I was formerly ſaying, it is not upon a diſputable *Hypotheſis*, but on an attentive inſpection, that our *Virtuoſo* may ground his veneration of the divine wiſdom expreſſed in the diſpoſition and conduct of the cœleſtial bodies: which aſſertion may be in ſome meaſure illuſtrated by this compariſon. Suppoſe a man of parts heedfully looks upon a curious clock, and views how regularly and conſtantly the *Index* moves upon the dial-plate, how orderly and how diſtinctly the hours are ſtruck, how the alarum-bell rouſes mens attention at determinate times, and the chimes do at other times delight his ear by their harmonious ſtrokes; though this man, I ſay, cannot certainly decide a controverſy, that may ariſe from clock-makers; whereof one may affirm, that the machine is moved barely by *weights*; another may derive its motions from thoſe of a *Pendulum*; and a third may diſſent from both thoſe, and ſubſtitute to weights a *ſpring*: but which of theſe hypotheſes ſoever be pitched upon, it will ſtill be true, that the clock was not made by chance, but by a ſkilful and deſigning artificer; this being not founded upon the truth of this or that *Hypotheſis*, about the latent ſtructure of the engine, but upon the inſpection of the curious and regular *Phænomena* themſelves, that it manifeſtly exhibits. And ſo, notwithſtanding that *Galen* and other ancients did in many things differ from the moderns, about the ſtructure and uſes of the parts of the human body; yet neither this difference, nor the diſputes, that ſtill continue about the circulation of the blood, (at leaſt as to divers circumſtances and conſequences of it,) the motions and uſe of the *Lympha*, the cauſe and manner of digeſtion in the ſtomach, the nutrition of ſome parts by the nerves, and the like controverted points, are of moment enough to keep ſkilful conſiderers, either from acknowledging, or ſo much as from admiring, the wiſdom of the divine opificer, that ſhines in the manifeſt and undiſputed contrivance and œconomy of a human body, alive and dead.

To the foregoing remark I ſhall add this that follows. *Though*, as has been newly ſaid, there is not any of the mentioned *Hypotheſes*, that ought to hinder its embracers from diſcerning the marks of an excellent wiſdom, in the ſyſtem and motions of the heavenly bodies; *yet* one of theſe theories may make it out much better than another does: and on that account, our *Virtuoſo* may have a clearer and more affecting view of the divine wiſdom, that is expreſſed in the cœleſtial part of the univerſe, and eſpecially in the ſituations and motions of the lights that adorn it, than the erroneous, or very imperfect theories of the vulgar philoſophy, or the Ptolemaic aſtronomy, are capable of affording him. I could alledge, as a ſtrong preſumption in favour of this opinion, that the indefatigable induſtry of the modern *Virtuoſi*, and the noble diſcoveries they have made by the happy invention of the teleſcope, having given them a much fuller information of the number and *Phænomena* of the fixed ſtars and planets; the theories thereby ſuggeſted are more true than the ancient and vulgar ones, and on that account very like to diſcover to us more of the wiſdom of the divine author of this great and wonderful fabrick. But to deſcend to ſomewhat more particular, I ſhall add, *that* whereas the greater part by far of the modern *Virtuoſi*, that are any thing verſed in aſtronomy, favour the doctrine of *Copernicus*, as it is improved by the diſcoveries made by the help of the teleſcope, you will not wonder at it, if you duly weigh the advantages this *Hypotheſis* has of that, which is vulgarly received. And though it will not be proper for me to enumerate and inſiſt on them, yet it may not be amiſs to touch upon two or three of the chief.

And firſt, by the Copernican ſyſtem divers inconveniencies are avoided, that do very much incumber the Ptolemaic. As for inſtance, the *Primum Mobile*, that muſt be of a greater diameter than the firmament, and move with ſo much force and ſwiftneſs, as to hurry all the ſtars of heaven, as well fixed as wandering, in twenty four hours about the earth, is rendered needleſs. And ſo is that ſtupendous and incredible ſwiftneſs, wherewith a ſtar or deſignable point in the equinoctial of the *Firmament* is computed to move fifty thouſand times faſter, than a correſpondent point upon the equinoctial of the *terreſtrial Globe*. And yet this laſt named point is eſtimated to be moved no leſs ſwiftly, than a bullet ſhot out of a cannon. The Copernican *Hypotheſis* does alſo take off that extreme violence, that is perpetually offered by the *Primum Mobile* to the inferior heavens, which it rapidly whirls about from Eaſt to Weſt contrary to the natural inclination of the planetary orbs, which continually makes them tend from Weſt to Eaſt. The ſame doctrine likewiſe frees the heavens from the cumberſom *Epicycles*, which the vulgar theory places in divers of the orbs, and particularly an incredibly vaſt one in that of *Venus*. It takes away likewiſe the ſolidity of the ſpheres, which makes it extremely difficult, if not impoſſible, to conceive, how they can exerciſe the contrary motions attributed to them, one within another; not to mention,

that theſe preſumedly ſolid orbs are inconſiſtent with that fluidity of the interſtellar part of the heavens, that may be inferred from the free trajection of the cœleſtial comets, and divers other *Phænomena*.

Secondly, the *Hypotheſis* we ſpeak of does both render as good an account as the other, of what is more obviouſly obſerved in the ſtars, ſuch as the viciſſitudes and various lengths of the day and night in ſeveral parts of the earth, the ſucceſſive ſeaſons of the year, the *Phaſes* of the moon, her eclipſes, and thoſe of the ſun, *&c.* and gives a far better account of the more difficult *Phænomena* in the theory of the planets, as the directions, ſtations, and retrogradations of ſome of them; why *Venus* is never diſtant from the ſun above 48 degrees, and Mercury far leſs; and why the earth is never interpoſed between the ſun and either of them.

And laſtly, this *Hypotheſis* ſeems to have much more concinnity than the Ptolemaic, and to be much more congruous, *as* to the courſe, that nature holds on other occaſions, *ſo* to the wiſdom of the divine opificer of the heavens. For great bodies, ſuch as the *ſtarry Heaven* or *Firmament*, ſeem rather made for reſt, and little ones for motion; which therefore may be beſt aſcribed to the earth, which is but a phyſical point in compariſon of the other. Beſides, whereas nature is wont to perform her work by the moſt compendious ways, it ſeems unreaſonable to ſuppoſe, that ſhe will keep the vaſt cœleſtial bodies in a perpetual and moſt rapid motion, when all that invites them to aſſert theſe amazing motions, may be as well performed by a ſimple turning of this phyſical point, the earth, about its own *Axis* in twenty four hours. And this ſome pleaſant diſciples of the new philoſophy think ſo extravagant, that they ſcruple not to repreſent it no leſs unreaſonable, than it were to make the ſhore move about a ſhip at anchor, inſtead of making the ſhip ſail along the ſhore, that the mariners might take a view of it; or to make the auditory walk round about the pulpit, inſtead of making the preacher turn his face ſucceſſively to the auditory. And this incongruity they judged to be the greater, becauſe the ſun has no need of the earth, that may invite it to motion for its ſake; but the earth has great need of the ſun, and receives all the benefit of the motion, that one of the two is ſuppoſed to make about the other. The violent and contrary motions aſcribed to the planets are much leſs agreeable to the ſimplicity of nature's ways of acting, than the ſingle and regular motion, that *Copernicus* aſcribes to each planet, conſtantly moving according to its own natural inclination from Weſt to Eaſt. And *Galileo*, *Gaſſendus*, and other elder Copernicans of this age, would have wonderfully rejoiced, and looked on it as a great confirmation of the Pythagorean doctrine, *that the earth is a planet*, if they had known what the happy induſtry of later years has diſcovered; namely, that as the earth turns about its own centre, ſo there are other ſtars unqueſtionably planets, as Jupiter and Saturn, that do the like, though not all of them in the ſame number of hours. And perhaps ſuch a converſion about their own *Axis* may be found even among the fixed ſtars, ſince the ſun, who ſhining by its own light ſeems to be one of thoſe, does probably make a revolution about his *Axis* in about twenty ſix or twenty ſeven days, as is plauſibly conjectured by the motion of ſome ſpots, that now and then laſt long enough (as with a good teleſcope I alſo had opportunity to obſerve) to finiſh an entire revolution in the forementioned ſpace of time.

Other advantages may be mentioned, that warrant the preference our *Virtuoſi* give to the Copernican *Hypotheſis* before the vulgar. But I forbear to mention them, partly becauſe I could not do it without many words; partly becauſe you may find moſt of them judiciouſly laid down by the learned *Gaſſendus* in his Aſtronomical Inſtitutions, to which I therefore refer you; and partly becauſe I preſume what has been already ſaid, may ſuffice to juſtify this inference, that ſince a popular conſideration, or theories in divers points defective or erroneous, have been able to convince even heathen philoſophers, as well as multitudes of other men, that the diſpoſition and motions of the cœleſtial parts of the world argued a *wiſdom*, worthy to be aſcribed to *God* or *Gods*; a more true and full information of the ſtate of that nobleſt part of the world is able to furniſh a Chriſtian *Virtuoſo* with ſolid grounds, for a high veneration of the divine wiſdom and goodneſs, and ſuitable ſentiments of piety. * * *

Propoſ. I. Sect. I. Subſect. 3.

APHORISM.

The mineral Kingdom, as, after the chemiſts, moſt writers now call it, compriſes a far greater multitude of different bodies, than now naturaliſts, even moſt of the chemiſts themſelves, are aware of; and I know not whether there be not ſome kinds of them, that were not known to *Albertus Magnus*, *Geſnerus*, *Encelius*, and others, not excepting *Agricola* himſelf, that it would perhaps puzzle them to know to what eſtabliſhed claſſes they can properly be referred. The curioſity I once had to make a collection of the native ores, and other minerals and foſſils of *England*, furniſhes me with not inconſiderable ſtore and variety of them; and if I had not been quite diſcouraged by the diſaſter of a ſudden fire, that broke out in the midſt of the night in my lodging (whence I was forced to be carried out in my bed-clothes) and occaſioned a concourſe of ſoldiers from a neighbouring guard, and had diſſipated, burnt or confounded the titles of the particular bodies, I ſhould doubtleſs have much encreaſed the number of the different ſorts of minerals, that this kingdom affords

Propoſ.

Propoſ. I. Sect. I. Subſect. 4.

APHORISM I.

If you ſhow an obſerving man, that has ſeen but common watches, one of thoſe curious watches, that ſhow beſides the hour of the day, the day of the week, and of the month, the age of the moon, the riſing and ſetting of the ſun, and the tides, that continually vary according to the age of the moon: this perſon, though he will look upon the watch, as it is able to ſhow him the hour of the day, as a fine piece of workmanſhip; yet if he be informed and ſatisfied of the other, and particularly of the cœleſtial *Phænomena*, if I may ſo call them, that belong to that little engine, he will have a much higher value both for the work and for the artiſt. For he, to make it fit for thoſe additional and noble uſes above-mentioned, muſt not only have the ſkill of a bare mechanician, but be acquainted with the motions and periods of the heavenly lights, and thoſe of that vaſt portion of our inferior world, which under one name, the ocean, comprehends many ſeas; becauſe the artificer muſt in the framing of his little engine have had due regard to all theſe, and conſequently have had a comprehenſion of divers cœleſtial and hydrographical truths. This gives me a riſe to obſerve, that the knowledge and providence, which the divine author of things has manifeſted in his animated works, though it be very conſpicuous in the organization of the matter of a hen, for inſtance, and her chickens; yet to a ſkilful conſiderer, it will appear greater upon another account, I mean that of inſtincts. For though it be very improbable, that ſuch an exquiſite ſtructure, as that of a hen, ſhould have been made by chance luckily connecting and diſpoſing the ſmall parts of the matter, whereof the animal conſiſts; yet it is far more improbable, that chance ſhould produce an engine, that is not only furniſhed with what is requiſite for its own ſupport and welfare, but with organs for the propagation of its *ſpecies*, and, which is more, with impreſſions, that look like notices and affections, that do not belong to mere mechaniſm, but to providence, which foreſaw what was like to befal this engine at certain times, and in certain ſtates of it, and accordingly provided for ſuch occaſions and emergencies.

APHORISM II.

Adam having been formed the laſt of all the viſible works of God, at the firſt opening of his eyes, ſaw plants and animals at their full growth and their full perfection; and no doubt was raviſhed into admiration of ſuch exquiſite and beautiful contrivances, as that glorious ſpectacle invited him to contemplate. But theſe curious machines being made by the immediate hand of God, it was leſs wonderful, that by his omniſcience and omnipotence, ſuch works ſhould be conſtructed; but he might think, that the parts of the matter they conſiſted of, could not without the immediate and continual guidance of the divine artificer have been brought to conſtitute ſuch curious and elaborate engines, which muſt be therefore uncapable to be imitated or produced by any other agent, or in any other way. But if he afterwards obſerved the propagation of plants from their ſeeds; and how from ſo ſmall a body as an acorn, for inſtance, there ſhould without any help of man be gradually formed a tall oak with all its trunk, branches, *&c.* and, which is more, its numerous acorns, each of which contains in a ſmall part of it, perhaps ſcarce exceeding a good pin's-head, the model of a future oak; if, we ſay, he took notice of this, and conſidered by what ſimple methods, without any mechanical tools or inſtruments, the firſt acorn became an oak, ſuch as we have mentioned; he probably more admired, that ſuch a machine ſhould be produced after ſuch a manner; and that the firſt oak, that was the parent of it, ſhould be framed without any tools at all by a divine artificer. Incomparably ſmaller bodies there are than acorns are found to be, the ſeeds, that produce great trees, ſome of them perhaps bigger than oaks: but I choſe to take an inſtance from acorns, becauſe the oak is ſo obvious and well known a tree.

If alſo we ſuppoſe *Adam* to have obſerved the ſteps, whereby a hen or other animal is produced from the *cicatricula* of an egg, whereof perhaps not near the ten thouſandth part, a perfect animal, I ſay, furniſhed with all that multitude and variety of organical parts, or ſubordinate machines, that concur to compleat it; he ſaw yet more cauſe of admiration, eſpecially ſuppoſing him to have conſidered, that ſuch large birds as oſtriches, and ſuch large animals as allegators and crocodiles, do notoriouſly ſpring from eggs; and ſo perhaps do far greater animals than theſe, though not ſo manifeſtly, becauſe they are not excluded nor found encloſed in ſhells. The fabrick of theſe living machines is very wonderful; but it is perhaps no leſs ſo, that ſuch curious pieces of work ſhould be produced by ſuch ſimple ways, as a few laws of local motion, whoſe efficacy is determined by the preſent conſtitution of the world, eſpecially thoſe parts of matter, that they act upon, or that act upon them. Which puts me in mind of *Euclid*'s *Axiomata* and *Poſtulata*, which, as few and ſimple as they are, led that ſkilful geometrician to the myſtery of that admirable ſcience, and even to the abſtruſeſt propoſitions, and to all of the tenth book of his elements, which one will admire, how the wit of man could be able to diſcover by any means whatſoever, much more by a few ſuch plain and ſimple ones as we lately named.

If an Indian, or country fellow, or a man wholly unacquainted with mathematicks, ſhould be ſhown out of a window a fine garden and neighbouring landſkip; and ſhould ſee a ſkilful painter with his pencils, and great variety of colours, draw the picture of them very much to the life, he would juſtly eſteem

eſteem his ſkill. But if a maſter of opticks ſhould tell him, that he would make him a fine picture of all the things there repreſented by thoſe pencils, and colours, or ſkill in painting, by ways far more ſimple, the ſpectator would ſcarce believe him: but if the artiſt ſhould by barely darkening the room, by putting to the ſhuts of the windows, and letting in the light at a hole duly placed and covered with a convex glaſs; he would be amazed to ſee in a trice, upon a ſheet of paper held at a juſt diſtance from the glaſs, a whole landſkip curiouſly delineated with the proportions, colours, and ſituation upon the plants of the garden; and, which the landſkip could not ſhow, the ſeveral motions, that the flowers and leaves were chanced to be put into by the wind, and ſuch a picture, (to add that upon the by) though leſs diſtinct and vivid, may be made without the help of the glaſs, eſpecially if the ſun ſhine upon the garden, when the ſpecies enter at the hole.

APHORISM III.

THERE are other creatures ſubjected to man's direct dominion, that are of very great uſe to him without exceeding the number of twenty or thirty.

To which belongs the oak, the fir-tree, the cocoa-tree, the cotton-tree, the vine, the plant that bears the pepper, the plant that affords indico, wheat, rice, mayz, flax, hemp, horſes, beeves, ſheep, beavers, dogs; and in the northern countries deer, (taking that name in a large ſenſe) to compriſe elks, rein-deer, *&c.* and in hot climates, camels, and elephants; and in the ſea, whales, not to mention clays (for bricks, pots, *&c.*) Common ſtone for building and manuring of ground, and the ores of metals, whoſe utility is generally enough known.

I MUST not here forget to take notice, that even poiſonous creatures are not all of them to be excluded from the number of thoſe that are found to be highly advantageous to multitudes of men, and conſequently to deſerve their gratitude. For not to mention the great medicinal virtues of vipers and ſcorpions, that opium is a poiſon to moſt men, that are not by degrees uſed to it, in caſe it be given, though but in few grains, as ſix or ſeven, and perhaps far leſs, many tragical inſtances have declared, and yet it is, if ſkilfully given, of great efficacy to multitudes of perſons of differing ages and complexions, and in great number and variety of diſtempers as is notorious to phyſicians and apothecaries, and many others beſides. And as one poiſonous plant, as the poppy, whoſe juice affords opium, is in many caſes a noble medicine; ſo another poiſonous plant, by a very ſlight preparation, affords a very uſeful aliment. The plant I mean is mandioca, whoſe root (though when it is crude) is believed to be poiſonous; and a general of the Engliſh forces in *America* told me, that in his army ſeveral animals were killed by the uſe of it, before they knew the miſchievous qualities of it. And yet by a ſlight preparation, not only the juice of this root is made a drink, that is in great requeſt and common uſe among the Indians, but a great part of the people of divers vaſt regions of *America* live upon it as we do upon bread; their caſſavi, which is made of the conſiſtent ſubſtance of the root after the juicy part is ſeparated from it, affording them a ſubſtance analogous to our bread, which I have ſeen very white, and have ſometimes taſted with pleaſure.

AND if there be (for I ſpeak but conditionally, and very heſitantly) a truth in the vulgar aſtrology, or in ſome other doctrine of the influences of the cœleſtial bodies for ſuch a one, ſome things, that I have obſerved, incline me to think there may be, man may apply the ſtars themſelves to ſeveral beneficial purpoſes and uſes, particularly by making taliſmans, and the like bodies. Of which divers inſtances are given us by hiſtorians and travellers of good credit, and of which in another paper I deliver two memorable relations, that I had from very credible witneſſes upon their own punctual knowledge.

APHORISM IV.

GOD beſtowed upon man the dominion and uſe of all other animals, beaſts, birds, fiſhes, reptiles, and inſects, by direct donation, and together with them all vegetables that grow upon the earth, which he may make uſe of by employing them immediately, or oftentimes more to his advantage by the intervention of beaſts and other animals, to whom they ſerve for aliments, as theſe do for man, the number of man's direct ſubjects is more conſiderable than moſt men think; for the various kinds of four footed beaſts, birds, fiſhes, and other animals amount to a multitude, as thoſe that have been curious and induſtrious to find them out, and enumerate them have declared; and for plants, though botaniſts agree not ſo well, as it were to be wiſhed they did, about the ſeveral ſpecies of plants, yet by what we find in the diligent *Bauhinus*, there was in his time about ſix thouſand ſorts of plants, and the number has been ſince much increaſed, by what divers curious perſons have written, beſides which, I know two or three virtuoſi that are good herbaliſts, who travelling in divers parts of *America*, partly iſlands, and partly regions of the continent, found there and brought away for *Europe*, many ſcores, if not many hundreds of undeſcribed plants, ſome of which they ſhewed me, and others they preſented me to.

APHORISM V.

THAT ſo many and ſo various creatures as we have mentioned, to be directly ſubjected by God to man's dominion, may be of great advantage to him, and of more than they have been, when once they ſhall be improved by ſagacious and induſtrious virtuoſi, may appear very probable, if we conſider what great benefits accrue not only to ſingle per-

ſons, but to whole communities, and ſometimes even to nations by two or three vegetables, as many reptiles and inſects, and as few minerals, of moſt of which the uſes were unknown to the ancients, and thoſe of the reſt but little known; the vegetables I mean, are none of the greater ſtately trees, but plants which are moſt deſpicable for their ſmall bulk. The firſt of theſe is ſugar, made of the expreſs juice of the ſugar cane, which is brought both from the *Weſt* and *Eaſt Indies*, and that in ſuch quantities, that the little iſland of *Barbados* alone furniſhes *Europe* with the lading of many ſcore ſhips in a year; and a ſober knight, which was governor of it, told me, that, if I much miſremember not the number, that ſmall iſland did then furniſh *England* with about eleven hundred thouſand pound weight of ſugar of its own growth. The other plant, though reckoned but a weed, makes at this day a great part of the commerce between *Europe* and ſome American country, eſpecially *Virginia*; the latter of which country ſends yearly into *England* alone a conſiderable fleet freighted almoſt only with tobacco. If therefore two plants, whereof one is a reed, and the other a weed, and two inſects, the meaneſt ſort of animals, and a couple of rude and dark minerals have already been made to be ſo ſerviceable to man, by what they afford him, and by the various employments they give to ſome hundreds of thouſands of indigent perſons to cultivate, manufacture, and tranſport them, what may we not think of the benefits, that in proceſs of time, ſuch multitudes as we lately mentioned of other plants, animals, and minerals, may by man's induſtry be brought to afford him? All which improvements ought to excite man's gratitude to him, that made thoſe creatures to his hand, and endowed him with a rational faculty and fit organs to exerciſe his plenary dominion over them.

APHORISM VI.

Two reptiles there are that afford a great part of the wealth of divers whole countries, viz. that caterpillar, which we call the ſilk-worm, which is ſaid to have been brought into *Europe* about the time of the emperor *Juſtinian*, and now is ſo much uſed in a great many kingdoms and other countries, that its products, raw and manufactured, make the wealth of a great part of the inhabitants of the earth, and the pride of many more. The other is cochineal, whoſe nature I know is much diſputed; but an ingenious perſon, that was the firſt Engliſh governor of *Jamaica*, and was at his bidding me farewel, deſired to examine the Spaniards about it, informed me, that it was the hinder part of a peculiar ſort of fly, which was confirmed to me by a phyſician, whoſe writings are not unknown, that was born in *America*, who aſſured me, that he had not only ſeen the flies breed, but purpoſely bred them; how rich a commodity they are, the great rates that are given for them by dyers of ſcarlet, and ſeveral other colours, and alſo by men of other profeſſions do ſufficiently manifeſt.

APHORISM VII.

THERE is another thing that belongs to animal creatures in certain ſtates, which though it be not properly referable to any of the foregoing heads, and is not wont to be taken notice of by anatomiſts and phyſicians; yet ſeems to me to deſerve a peculiar mention and regard. The thing I mean is, that which is commonly called inſtinct, and ſeems to be a ſeminal, or at leaſt a congenite impreſſion, that inclines an animal whilſt he is in a certain ſtate, ſpontaneouſly to purſue or avoid ſome things, that tend to ſupply him with ſomewhat that he wants, or to make him avoid or eſcape ſomething that would endanger or hurt him. I ſpeak thus disjunctively, becauſe the inſtincts of animals are not all of one kind in differing ſpecies, and ſometimes are manifold even in the ſame individual; when he happens to be in differing circumſtances, though they all tend to one general ſcope, the welfare of the animal whom the inſtinct chiefly regards.

APHORISM VIII.

THESE impreſſions or propenſities are of ſo peculiar a kind, that not only they ſeem not referable to caſual mechaniſm, but have ſomething belonging to them, that is ſupra-mechanical, and beyond the reach, not only of mere chance alone, but of any plaſtic principle not framed by an intelligent and deſigning agent. For in the *ſtorge* or natural affections of divers animals to their young ones, as (that I may give a very obvious example) of hens to their off-ſpring. There appears in the parent manifeſt tokens of ſollicitouſneſs, ſkill, and in ſome caſes courage too, *in* ſitting upon her eggs for ſome weeks; *in* turning them from time to time, ſo as by her warmth ſucceſſively to cheriſh ſeveral parts of them; *in* taking care when they are hatched, to guide them, to provide for their ſuſtenance, and ſome time upon occaſion to defend them, and that with a ſtoutneſs, that belongs not naturally to thoſe tame and puſillanimous birds. Now it may deſerve to be conſidered, that this ſtrange affection towards her eggs and chickens, is no part, whether ſimilar or organical of the hen, who is completely organized and fitted for her own preſervation, before ſhe lays an egg. So that this *ſtorge* ſupervenes to the animal already perfect in her kind, and does not tend directly to her own preſervation, but on the contrary makes her loſe a great deal of time in ſitting, which ſhe might and would have otherwiſe employed to go in queſt of her own food, and makes her give herſelf a great deal of trouble, and ſometimes expoſe herſelf to a great deal of danger, for the ſake of a little helpleſs creature, that when grown up will exerciſe no gratitude towards her. When all this is reflected on, if it be alſo further conſidered, that this paſſionate concern of the

hen for her off-ſpring, is but a temporary thing, and ceaſes when the young birds are grown up to be able to live without their dam, and provide for themſelves: this wonderful ſtorge ſeems manifeſtly enough to declare, that it is an inſtitution, if not an artifice, of ſome benign and provident being, that juſt at a fit ſeaſon, and whilſt it laſts, and no longer, acts the parent to do things ſhe was never taught, that are as unprofitable to herſelf, as uſeful, nay neceſſary, to her otherwiſe helpleſs off-ſpring.

APHORISM IX.

AMONG the other things, which becauſe they are familiar, do not ſo much as engage our attention, much leſs excite our wonder, we muſt not forget the eggs of dunghil hens. For though their commonneſs makes men daily eat them, without looking on them but as aliments; yet a heedful inſpection may ſoon manifeſt, that they deſerve more regard. This it were not hard to ſhow by ſeveral inſtances, but it may ſuffice for our preſent purpoſe to point at two. The firſt is the *cicatricula* or ſmall round ſpeck, that is to be ſeen on the coat of the yolk of an egg. For in this very ſmall part of the egg, the curioſity of the excellent *Malphigi* has lately diſcovered a chick already formed, with all its eſſential parts; ſo that the incubation of the hen does little, or nothing more, than diſſolve the humours of the egg, and procure that the parts of the chick, that ſeemed indiſtinct, or ſcarce (if at all) viſible before, coming to be enlarged by the acceſſion of aliment ſtored up by nature in the egg itſelf, are diſplayed, and become firſt manifeſt and then conſpicuous. The order and ſeries of oppoſite changes, that may be obſerved in this curious work of nature, to turn a *cicatricula* into a perfect chick, is truly admirable, as will eaſily be confeſſed by him, that has read our excellent *Harvey*, and ſome other modern anatomiſts, who have further and happily cultivated that ſubject.

WHEREFORE I paſs on to my ſecond inſtance, which I ſhall take from one part of the ſtructure of an egg, which ſeems trivial, and accordingly is wont to be overlooked. For the treadles of the egg, which have been for many ages erroneouſly thought to be the principles of the chick (though each egg has two of them, and thoſe very diſtant from one another) theſe, I ſay, are conſiderable parts of a wonderful mechanical contrivance; for ſuch that is, that ſuſpends a fluid body, as is the yolk of the egg in the midſt of another fluid; the white, which incompaſſes the yolk equally on every ſide, and that ſo conſtantly, that which way ſoever you turn the egg, the liquors retain their due ſituation in reſpect of one another. And this is ſo fine and difficult a piece of mechaniſm, that the moſt ſkilful artiſts, (whether mathematicians or chemiſts) that have attempted to *detain* one liquor in the midſt of another, every way ambient, have found their induſtry defeated. And though my endeavours to perform this have perhaps made a ſomewhat nearer approximation, yet I willingly confeſs, that the utmoſt I was able to do, did but very imperfectly imitate what nature excellently does in the ſituation of the yolk and white of the egg.

APHORISM X.

As light as we make of the feathers of a bird, yet one of theſe may give even philoſophers juſt cauſe to admire the divine perſpicacity and providence. To take, for inſtance, the feather of a peacock's train, and yet to paſs by the curious mechaniſms, that may be obſerved in the feather upon the account of its quill and other parts; what a ſtupendous foreſight is argued by the half-moon that adorns it? For it is more than barely wonderful, *that* in ſo ſmall, and as to ſenſe, ſo ſimple and uniform a liquor, as that ſmall portion of an hatching egg, which later anatomiſts call the *Colliquamentum*, that appears to the eye an uniform liquor, there ſhould be ſome minute and diſtinguiſhable parcel of matter, which by virtue of the general laws of motion, and the fabrick of the egg, (which ſeems very ſlight and unelaborate) *that* I ſay, this ſmall portion of a drop or two of matter, ſhould by the divine governance be ſo carried through all the various changes of ſize, ſituation, motion, and contexture, which during the incubation it undergoes in the egg, that at length it ſhould appear in the feather in a new and peculiar texture, and vivid colour, quite different from thoſe it had in the *Colliquamentum*; and ſo exactly determined to a particular poſition, and (which is yet more ſtrange) to a true regard to all the other particles, that belong to the half-moon,) as to concur exactly with them all, to conſtitute that gaudy and pleaſant figure. This is ſtill the more wonderful, becauſe a ſkilful painter could not make it more fine in point of ſhape, nor adorn it with ſuch beautiful colours and thoſe changeable too; nor could ſuch a regular and vivid picture be made, unleſs every ſenſible part of it were as ſkilfully guided as that we firſt pitched upon, and ſo ſteered as both to attain its proper colour, and to arrive at its determinate place, and ſettle there, without ſtopping ſhort of it, or advancing ſenſibly beyond it.

YOU, Sir, to whom I have the happineſs to be ſufficiently known, will need but a ſhort advertiſement (if any) to perſuade you, that after all that I have ſaid, or ſhall hereafter ſay in this diſcourſe, to the advantage of philoſophical piety, I am far from any intention to depreciate, that ſublime and compleat piety which is taught in the goſpel, and much more from preferring natural religion to that which Chriſtians are bleſſed with by ſupernatural revelation. And indeed, though the fabrick of the world, and the goſpel diſpenſation, do both of them proceed from the ſame divine author, and therefore may without profaneneſs be compared with one another; yet the latter may without partiality be judged more admirable than the former. And in my opinion, it is pity, that ſo excellent a contrivance as the divine wiſdom and goodneſs has deviſed for the ſalvation of men, ſhould not be more worthily

treated

treated of, and ſhould not have its myſterious receſſes better looked into, and more ſkilfully diſplayed, than they are wont to be in common place books, and vulgar (though perhaps pompous) courſes of theology. And indeed the divine wiſdom and beneficence, not to mention other adorable attributes can ſcarce be *ſo* wonderfully exerciſed in ſuch an ignoble a ſubject as ſenſeleſs matter, in all whoſe productions and phænomena, how various and wonderful ſoever they appear to us, there needs but the guidance of the local motions of the greater and ſmaller fragments of it according to a very few laws which they are not diſpoſed to diſobey, *as* in governing ſpiritual beings and free agents, that have wills, intereſts, and deſigns, of their own.

But I fear, you will tell me, that I wander from my ſubject, (which yet on this occaſion, I think but a venial fault,) and therefore I ſhall only in this place hint to you, that the ſtudy, how ſucceſsful ſoever, of corporeal things, can give us but a mechanical knowledge, and diſcover to us nothing but variety of mechaniſm; whereas the ſtudy of immaterial and ſacred things, may procure us the knowledge of incomparably nobler objects, and of ſuch depths and fetches (if I may ſo ſpeak) of wiſdom and providence, as human reaſon without illapſes of divine light, would never have diſcovered, and as *the angels themſelves deſire to pry into*. And having ſaid thus much, which probably is more than enough, to ſhow that a man, that admires the wiſdom of God conſpicuous in his works, may diſcern both it and divers other adorable attributes, more gloriouſly diſplayed in the book we call ſcripture, than in the book of nature. I ſhall now reſume my interrupted diſcourſe.

SECTION II.

The ſecond ſection ſhews the religious uſe a *Chriſtian Virtuoſo* may make of the contemplation of the *Microcoſm*, which conſiſts
Sub-ſect. (1.) of four parts. The 1ſt relates to the anatomy of a dead human body, and the me-
Sub-ſect. (2.) chaniſm of a living one. The 2d relates to the human mind, or rational ſoul, and the faculties and powers it has within itſelf, as belonging to its own diſtinct nature. The
Sub-ſect. (3.) 3d relates to a man, as he is a being integrated by a human mind and living body, ſtrictly aſſociated by certain laws of union or conſociation eſtabliſhed by God in this monadical creature. To which ſub-ſections there
Sub-ſect. (4.) are joined, *fourthly*, ſome applicatory reflections on the whole.

Having diſpatched what I thought fit to ſay about the *Macrocoſm*, I proceed to take notice of ſome helps to piety and devotion, that may be afforded to our *Virtuoſo* by the conſideration of the *Microcoſm*, as the ancient philoſophers, as well as the later chemiſts, have ſtiled man. * * *

But that you may not expect in the following papers, what I did not intend they ſhould contain; it is very neceſſary, that you ſhould ſeaſonably know, (though it be not perhaps neceſſary, that I ſhould ſolicitouſly inform you of it) that I do neither *pretend* nor *purpoſe* in this paper, to treat of any works of nature as they are ſuch, and are endowed with phyſical qualities and other affections. Since my deſign is to conſider thoſe few I have occaſion to make mention of, not chiefly, if at all, with reference to philoſophy, but to religion, as the contemplation of them may conduce to piety, and ſuggeſt reflections fit to excite and cheriſh devotion.

The firſt SUBSECTION.

Though the dignity of the ſubjects ſeems to require, that we ſhould begin what we have to ſay of man, rather by the conſideration of the rational ſoul, than by that of the human body; yet I ſhall chuſe to treat firſt of this latter, both becauſe the body is generally reputed to be more known to us than the mind; and becauſe the knowledge of the body, and its corporeal functions, may aſſiſt us to diſcover the nature of the mind, by reflecting on thoſe operations, that exceed the mechanical powers of the body, or even thoſe of matter taken in a more general ſenſe. And it may perhaps recommend this order, that it aſpires to imitate that of the infinitely wiſe author of human nature, who firſt framed the body of *Adam*, and then breathed the ſoul into it: thus preparing the manſion, before he thought fit to introduce the inhabitant.

As human bodies are found in two very differing ſtates, namely whilſt they are living, and when they are dead; ſo they may fall under two diſtinct conſiderations. But in this place, where I do not pretend to treat fully of the ſubject, I ſhall for brevity's ſake allow myſelf ſometimes to intermingle my reflections on both, as they occur to me, and leave you to ſort them, if you think fit.

Though a living animal be confeſſedly by great odds preferable to the ſame animal deſtitute of life, yet becauſe the knowledge of the ſtructure and contents of a cadaver has been more cultivated by phyſicians, and is more eaſily attainable than that of a living man, I ſhall begin with the leſs worthy ſubject. I ſay then, that even a dead human body, though an engine by very great odds inferior to a living one, does yet abound with, or rather conſiſts of, parts ſo curiouſly framed and ſkilfully united into one engine: that to give a ſatisfactory account of all the particulars in it, that manifeſt an excellent wiſdom in the mechaniſt, would oblige me to tranſcribe almoſt a whole inſtitution of anatomy. For which reaſon it may ſuffice for my preſent purpoſe, curſorily to mention ſome of the chief heads, to which the particular reflections, that my intended brevity forbids me to inſiſt on, may, I think, be commodiouſly enough referred: ſuch are, firſt, the number, and ſecondly, the variety of the integrant parts of the body; thirdly, the fabrick of theſe, conſidered as parts; and fourthly,

ly, (and laſtly) the contrivance and ſymmetry of the whole machine as ſuch.

But though, that I might not too much wrong my ſubject, I thought fit to enumerate the newly mentioned particulars; yet I hope you do not expect to find them ſeparately enlarged upon, in papers that muſt make but a part of a tract, which when entire, ought not to be great. On which account, and that of my want of leiſure, I ſhall make reflections but upon *ſome* of them by way of *ſpecimens*, contenting myſelf to have named the reſt, and to declare, that I decline treating of them as well as the others, not out of diſeſteem, but becauſe I cannot treat of all I have enumerated. And this advertiſement I deſire may be extended to all the remaining part of this (ſecond) ſection, and applied to the other liſts of particulars, which would, if all of them were inſiſted on, make the firſt propoſition (of the ſecond part) enormouſly diſproportionate to the reſt.

Article I. That the *number* of the manifeſtly diſtinct parts of a human body, in proportion to its bulk is very great, eſpecially if compared with thoſe that ſuffice to make up even the moſt curious artificial engines, as clocks, watches, *&c.* will be eaſily granted, if we conſider, that thoſe groſſer parts, the bones, notwithſtanding the fewneſs of them, that are uſually taken notice of by the vulgar, are reckoned to be above 250; nay, I find, that the famous and diligent anatomiſt *Veſlingius*, aſſerts them to amount to more than 300. And it is known, that many of the bones have each of them ſeveral muſcles faſtened or belonging to it; and a muſcle is uſually furniſhed with two tendons, blood veſſels, and divers other parts. And not to mention thoſe parts, that are found either ſingle, as the heart, liver, ſpleen, *&c.* or only in pairs, as the eyes, the ears, the teſticles, *&c.* There are ſeveral other ſorts of parts, whereof each ſort contains many of the ſame denomination to be found in divers parts of the body, as cartilages, ligaments, and more plentifully glandules of divers kinds, membranes, nerves, veins, arteries, *&c.* To ſay nothing of the liquors to be met with in a human body, as blood, gall, chyle, *ſuccus pancreaticus*, *lympha*, &c. But that a human body compriſes very numerous parts, will be further manifeſted, if we proceed to take notice of the variety of them, ſince it will appear highly probable, that an engine, that conſiſts of ſo great and conſpicuous variety of parts cannot but comprehend a multitude of them.

Article II. The *variety* juſt now mentioned, may in great part be eaſily deduced from what has been newly ſaid already, but becauſe the enumeration there made is very imperfect, the number and differences of diſtinct ſorts of parts would much better appear, if the limits this paper ought to have, would permit me to diſplay the ſeveral diſtinctions, that naturaliſts and phyſicians have been obliged to make of the parts of a human body, as into ſimular and organical, into head, cheſt, and limbs, into parts containing, contained, and impellent, to mention now no more of ſuch like diſtinctions, but I am reduced for brevity's ſake, to refer you for ſatisfaction, to what will abundantly give it you, the attentive ſurvey of a ſkilfully diſſected body. For there you will not only ſee many different ſorts of parts, as bones, veins, arteries, nerves, cartilages, ligaments, muſcles, fibres, membranes, parenchyma's, as they are called, glandules, *&c.* But you will eaſily obſerve, that the parts compriſed under each of theſe ſorts or denominations are many, if not moſt of them manifeſtly diverſified by diſtinguiſhing accidents, ſuch as bulk, figure, conſiſtence, texture, colour, *&c.* As bones are ſome far bigger, and ſome much harder than others are, unlike in ſhape, have epiphyſes and apophyſes, differing in ſituation, connexion, and other accidents; ſo the membranes of the eye differ from moſt others of the body, and not a little from one another, as is evident in the *cornea* and the *retina*, ſo the milky and the lymphatick veſſels differ from other veins, and the valves of the two ventricles of the heart differ both in ſituation, figure, and ſtrength, from thoſe of the ſanguiferous veins, and of the lymphæducts, ſo in the muſcles there is a wonderful diverſity, either (to omit their being, or not being ſphincters) as to their largeneſs, thickneſs, tendons, corneous portions, thinneſs of fibres, number, ſtrength, and tendencies of fibres, ſhapes, bigneſs, number, origination and inſertion of the tendons, of which moſt are entire, but ſome perforated by other; ſo of glandules, ſome are conglobated, as the moderns call them, and ſome conglomerated, or cluſter-like, ſome very large, and others in compariſon extremely ſmall, as many of thoſe formerly unobſerved ones in the ſtomach, and divers other places; and theſe glandules are reſpectively furniſhed with an artery, a vein, and nerve, and uſually alſo an excretory veſſel ſuitable to its ſize and uſes, to all which kinds of parts, if we add ſuch as, for the peculiarities belonging to them, ſeem not ſo clearly referable to any of the former kinds, ſuch as the vitreous ſubſtance, the horny coat, as it is called, and the cryſtalline lens of the eye. And alſo thoſe parts of a female human body, that belong peculiarly to the ſex, and thoſe temporary ones, if I may ſo call them, that are proper to a woman that is big with child, and come off after her delivery, and which ſome anatomiſts therefore call deciduous parts, ſuch as the placenta uterina, urachus, and the different membranes that involve the fœtus; if, I ſay, to the formerly enumerated kinds of parts, we ſubjoin theſe two additional ſorts, we ſhall find the number of parts that deſerve to be looked on as diſtinct, and the various accidents, that diverſify them to be exceeding great, which I think may be more probable, if you conſider with me (what is too little taken notice of) that this great multitude and variety of parts, whereof this human engine conſiſts, are (without need to interfere in their actions) packed up in incomparably leſs room, than the beſt

mechaniſt in the world would require; for an engine of very much fewer and leſs different parts, eſpecially, which I deſire you to reflect on, if due regard be had to the ſtrength, as well as diſpoſition of the parts; for this ſtrength is wonderful in divers that make up the human body, as may appear by the wonderful things, that ſome muſcles will perform, and ſome tendons and ligaments ſuſtain; for during that time where nature aims not at the ſtrength of parts, but their fabrick and confirmation, or, in a word, the due organization of the matter, as in an embryo, almoſt all the parts of a man at his full ſtature are to be found crouded, yet without interfering, injuring, or hindring each other, into a fœtus incredibly ſmall, ſince it is delivered by anatomiſts of great authority, that about the end of ſix weeks, or ſuch a term, as may ſuffice to ſhow the little model of a man to be compleatly animated, it is ſometimes ſcarce any bigger than an ant or piſmire. This may appear incredible to many, and it would have done ſo to me, if I had not remembred, that when I made the obſervations, elſewhere mentioned, about the progreſs obſerved by nature in the hatching of the eggs of hens, I found it true what our famous *Harvey*, and ſome of his followers have noted, that the bird proceeds from the cicatricula, or white ſpot, that is found upon the coat, or membrane of the yolk, the reſt of the fluid matter of the egg being employed to nouriſh the daily growing *embryo*; for the proportion of this little ſpeck, as ſome good authors call it, of the whole body of the egg, or that of the compleat chick is ſo very ſmall as ſcarce to be at all conſiderable, as will be readily granted by thoſe, that having compared the ſmall dimenſions of the animated ſpeck with thoſe of the cavity of the whole egg, and made due allowance for the imperfection of the figures, ſhall on this occaſion make uſe of the mathematical rules about triplicate proportion.

But I muſt not inlarge on a ſubject, that would lead me too far, and therefore it ſhall here ſuffice to add this reflection, that the number and variety of the parts of a human body are ſo great, that the names of the parts *already* obſerved (and I am confident *all* that may be are not ſo) might, if well ranged, almoſt ſuffice to make a dictionary, the terms that diſſectors have been obliged to employ, to expreſs the parts of the leſſer world, are more numerous than thoſe that mathematicians have thought fit to make uſe of in aſtronomy and geography put together; ſo that an anatomical dictionary may be more copious than a coſmographical one, which you will perhaps the more eaſily believe, if I add this reflection, that beſides the diſtinct parts conſidered ſeparately, there are many things fit to be declared in the writings of anatomiſts about the ſituations, inſertions, and connexions of parts, as to omit the ſyſtem of muſcles that compoſe the heart, the manners wherein the bones are joined are ſo many, that they are nine or ten harſh terms, ſuch as ſynchondroſis, ſynneuroſis, gomphoſis, arthrodia, ginglymus, *&c.* to expreſs them.

Article III.

The conſideration of the parts of a human body looked upon *ſeparately*, that is, as each of them is *ſingle* or connected with only *ſome others*, and not united with *all* of them into one engine, (for this, conſidered as ſuch, is to be the head of the fourth article:) this conſideration, I ſay, added to the two foregoing articles, may manifeſt how exquiſitely framed a fabrick the human body is; the parts that make it up being not more numerous than conſiderable for the differing ſtructures and conſiſtences of them: all which are here compriſed under the name of the *fabrick of the ſeveral integrant parts* of the human body. I ſay then, that the parts conſidered as ſuch, may afford a great many inſtances to our preſent purpoſe; but time will not permit me to take notice, in this place, of more than one or two.

The firſt of theſe is the eye, which in a little room compriſes ſo many curious parts, and ſo ſkilfully aſſociated into one inſtrument of viſion; that as great a variety of objects as it ſurveys in the ſpacious univerſe, it ſcarce diſcovers any thing more exquiſitely framed than itſelf.

This part of the body, as ſmall as it is in bulk, hath ſeveral *auxiliary* parts belonging to it, and is itſelf compoſed of a conſiderable number and variety of *conſtituent* parts.

For anatomiſts are wont to reckon as belonging to the eye, not only the newly mentioned adjuvant parts, which they call contained, but thoſe others to which they give the name of containing, ſuch as *the pericranium*, that lines the *orbit*, or ſocket of the eye; *the* two eye-lids, *the* two *canthi* or glands at the two corners of each eye; *the* fat, to fence the eyes from cold, and help to keep them dry; the ſix muſcles, four right ones, and two oblique ones, whereof one of the firſt ſort ſerves to raiſe the eye, another to depreſs it, a third to draw it to the right hand, and the other towards the left. And of the ſecond ſort, one draws obliquely downwards, and the other obliquely upwards; and this laſt named is furniſhed with an unuſual addition like a pulley to ſtrengthen it, as both that muſcle, and each of the fifth is with ſmall nerves to convey to it ſpirits for ſenſe and motion. Nor do theſe want others of the containing parts of the eye, that are themſelves compounded enough; as the gland ſeated at the outward corner of the eye, and by ſome called *innominata*, which though leſſer than the other, is yet a conglomerated one, (that is made up of ſeveral ſmaller cleaving together) and furniſhed with capillary veſſels, veins, arteries, and *lymphæducts*. And in an eye-lid, beſides other conſtituent parts, as two fine ſkins, and between them a thin *membrana carnoſa*, we may obſerve all along the inſide of the edge a ſoft cartilage, beſides a row of hairs, that have this peculiar, that they do not grow as the hairs of the head and beard do; but having attained their full

growth, continue of the ſame length for many years together, ſo as not to need to be cut. And theſe eye-lids are of excellent uſe to the eye, ſerving *both* for curtains to keep out the light when it is not deſired, which the cartilages that ſtrenghten their edges, and help them to ſhut very cloſe, enable them the better to do, *and* to fence the eye from duſt, and cold, and ſmoke, and other outward injuries; *and*, which is more, to do it two ſervices that ſeem of a contrary nature: for the eye-lid *both* wipes the cornea when duſt or any ſuch thing adheres to it, and in a ſort dries it, by diſplacing inconvenient moiſtures; *and* yet, by the help of the lympha, it moiſtens the eye from time to time, which would ſoon grow dry, and helps it to move more glibly.

To advance now to thoſe intimate parts of the organ, that are called the contained, I think it worth obſerving, that there is ſomething in the texture of the *tunicles* of the eye, that is but imperfectly diſcovered by a diſſector's knife, and yet is an excellent part of the mechaniſm of it. For *whereas* the other nerves of the body are induſtriouſly hid by nature beneath other parts, to fence them from outward injuries, and from cold, by which the nerves are very much prejudiced; and *whereas* the outward coat of a nerve is wont to be extremely ſenſible of punctures, or the rude touches of external bodies; *whereas*, I ſay, theſe things are thus in other nerves, the bulb of the eye conſiſts mainly of the optick nerve expanded. For the *ſclerotis*, of which the *cornea* is a part, is an expanſion of the outward coat of the optick nerve; and yet the *cornea* is not eaſily offended, nor is apt to cauſe any convulſions, even when it is pricked quite thorough; and it is not only without harm expoſed immediately to the cold air, but even in froſty weather it is ſeldom ſenſible of any cold. And the other tunicle called *uvea*, though it proceeds from the internal and exceeding thin membrane of the optick nerve, yet it affords the *iris*, which is of a differing texture from the membrane before it enters the eye. And then that which paſſes for a tunicle under the name of *retina*, not only has its filaments ſo expanded, as to cover the bottom of the eye, and reach as far as the cryſtalline humour; but though it be a medullary part of a nerve, yet it is ſafely expoſed to the action of external bodies, whether lucid or illuſtrated, without loſing that exquiſite tenderneſs or ſenſibility, that makes it capable of being affected both by light itſelf, and by all the numerous modifications of light, that are, or produce colours. Which ſenſibility it can retain, though it be thus expoſed to the action of ſo many bodies, becauſe the pores of the diaphanous parts of the eye are ſo very ſmall, that the objects affect it but by the intervention of light, which is a thing proportionable to ſuch tender filaments, and therefore may be indured by them, though it act briſkly enough to make ſenſible, and perhaps vivid impreſſions on them.

It has three ſeveral humours, beſides the juices that ſerve to nouriſh it. It hath as many coats, and there belongs to it the optick nerve, and according to modern diſcoveries, limphæducts, beſides ſanguiferous veſſels, ſome of which I have had the good fortune to ſee and ſhew even in the nerve and other parts of an inferior order. Each of the humours has its own peculiar conſiſtence and nature, and as moſt anatomiſts teach, its membrane too. The *aqueous* humour is ſo called from the fluidity that makes it reſemble water; and though it paſs for inſipid, yet I have found, even without diſtillation, that it is not deſtitute of a fine volatile ſalt. The *vitreous* humour, though it be fluid enough to accommodate itſelf to the figure of any fitly ſized veſſel that it may be put into, is yet much heavier than water, and will lye with a diſtinct ſurface both in it and in many other liquors. And the *cryſtalline* humour (improperly ſo called) though it be clear like the ſubſtance, whence it had its denomination, is of a very differing texture from the other two, as is manifeſt to the touch, and as I have found by eaſy chemical experiments. There is alſo much diſparity both as to bulk, conſiſtence, and figure, between the ſeveral tunicles or coats of the eye. Nor is the difference hard to be diſcovered between the other parts that concur to compoſe it, as is obvious to any that hath ſeen an eye well diſſected. Such a perſon will ſcarce fail of diſcovering, that it is not without wonderful art, that ſo many curious, and ſeveral of them very fine and tender parts, can be crouded together into ſo little room without hindering one another in the exerciſes of their motions and functions; but, on the contrary, be brought as it were to conſpire to aſſiſt each other in performing their motions glibly. And here let me obſerve, that the curiouſneſs of the mechaniſm of an eye deſerves not, perhaps, ſo much wonder as it is conſidered with relation to its anatomical ſtructure, as when it is conſidered with reference to light and to the laws of opticks. For the diſſector, who knows no more of the eye, than a dexterous hand, and a ſharp knife can teach him, will not be able to give others or himſelf a good account of ſeveral weighty queſtions, that may rationally be made about the ſtructure of the eye, and divers obſervables that have a ſtrict connexion with it. He ſees not for inſtance, *why* the cryſtalline humour ought to be placed between the two others; *why* the cornea ſhould be ſomewhat protuberant, and almoſt a portion of a ſphere; *why* the humour that lies next under it ſhould be fluid like water, rather than of ſuch a conſiſtence as the vitreous; *why* the cryſtalline ſhould be not of near ſo globous a form as the *cornea*, but of a double convex figure; and why both ſides of this natural *lens* have not the ſame kind of (the ſurface next the *cornea* being much flatter than the other) convexity; *why* the inſide of the *choroides* is of a figure ſomewhat reſembling that of a great portion of a hollow ſphere; and *why* it is of ſuch a colour; *why* the optick nerve, that reaches entire to the eye, ſpreads itſelf in ſlender filaments

ments all over the concave bottom newly mentioned, making an expanſion that looks ſomewhat like a net; *why* theſe filaments are ſo very tender, that they ſeem to be of a medullary ſubſtance, whilſt the *cornea*, though reputed to belong to the coat of the nerve, is not like the coats of other nerves eaſily ſenſible of the leaſt ſharpneſs in the body that touches it, nor of the great cold to which it is frequently expoſed in froſty weather. *Why* beſides the muſcles, that manifeſtly draw the eye this way and that way as a man pleaſes; there is in the eye itſelf another muſcular like action, whereby the bulb of the eye has its figure ſomewhat altered, being, as occaſion requires, ſometimes made a little oblong, and ſometimes a little flatter; *why* the cryſtalline humour is ſeated juſt at ſuch a diſtance from the *cornea* on one ſide, and from the *retina* on the other, but nearer the former, which is alſo ſomewhat protuberant; *why* the pupil, or hole in the *uvea*, is round, and not of any other figure; as (for ſpecial reaſons) it is in horſes, kine, cats, and divers other animals; *why* the pupil in its beſt and natural ſtate is pretty near of ſuch a determinate compaſs in the ſame perſon, and yet makes ſometimes a wider and ſometimes a narrower circle, but this within certain limits of dilatation and conſtriction, and only as occaſion requires, the variation not naturally exceeding thoſe bounds, nor much out-laſting the occaſion of it.

To theſe and many more ſuch queſtions that may reaſonably be propoſed, he will not be able to give the moſt ſatisfactory anſwers they are capable of, that is not well acquainted, if not with a natural light, but at leaſt *both* with the laws of the refractions, and reflexions of light, according to the bodies it meets with in its way; *and* with the properties of ſeveral figures in bodies, which qualify them to refract, or reflect the light, after very differing manners, as is apparent in the diſtinct (and ſome of them ſtrange) properties, that ſpherical, eliptical, parabolical, and hyperbolical ſurfaces have, to modify the beams of light, that falling on them, rebound from them, or paſs beyond them. So that, if I miſtake not, writers of dioptricks, ſuch as *Scheiner* and *Des-Cartes*, are as fit to be conſulted by him, that would know the unobvious uſes of ſeveral parts of the eye, as *Galen* and *Veſalius*, &c.

* * * And indeed the whole eye being deſigned for an inſtrument of ſight, the fitneſs of its parts to perform the functions it was intended for, will be beſt diſcerned and highlieſt valued by thoſe that can diſcover, *how* the tranſparency and differing refractive powers of the humours and the *cornea*, *how* the opacity of other parts of the eye, and eſpecially *how* the ſituation and anomalous figuration of the anterior and poſterior ſurface of the cryſtalline humour, and *how* the motions which the *ligamentum ciliare* may give it; to mention now no other adjuvant cauſes, concur to take in as many rays of light, as conveniently can be let in, and made convergent; and to refract and diſpoſe of all of them reſpectively after the beſt manner wherein they can be ordered, to make a briſk impreſſion upon the due parts of the *retina*, and paint there an image of the object, both *vivid*, and as *like* it, as the nature of things will permit.

The eye is, by the modern maſters of opticks, fitly compared to a darkened room, and by ſome of them to a teleſcope, or perſpective glaſs, that receives from without by the beams of light, that enter it at one hole, left purpoſely open to let them in, the umbratile pictures of external things. I have often employed ſuch a darkened room to make optical experiments and obſervations, and have endeavoured by the help of glaſſes fitly figured and placed, to make moveable inſtruments to anſwer thoſe ends, and yet ſmall enough to be carried in one's pocket. But all that I have hitherto ſeen are more inferior to the natural eye in point of excellency, than the greateſt of them exceeds it in bulk. And even thoſe things in the eye, that are looked upon by many as little uſeful, are really both neceſſary to ſight itſelf, and very uſeful to make it more compleat. For the aqueous humour, that is deſpiſed by ſome as an *inſipid* and worthleſs liquor, does beſides other good offices to the eye, ſupport the *uvea*, that it may hang freely between the cornea and the cryſtalline humour, and keep the *cornea* duly moiſtened and plumped up as it ought to be, to make the refraction required to diſtinct viſion, as may appear, when being by any miſchance let out, the *uvea* preſently ſubſides, and the ſight is depraved. And it is remarkable, that though nature regenerate neither of the other humours of the eye, yet the aqueous, if the wound be cloſed up, will in no long time be ſupplied by her, eſpecially if good remedies be employed, inſomuch that I have ſeen the eye of a gooſe, out of which we had purpoſely ſqueezed the aqueous humour, upon the application of an excellent balſam to the hurt, in the ſhort ſpace of two hours ſo cloſed and plumped up, that it looked like the other that was ſound. To this I ſhall add, that not only all the parts of the eye have their uſes, but there is in the eye ſomething that is not a part of it, and yet is not only uſeful, but neceſſary to viſion. This is it, which is called the pupil, or apple of the eye, which though it have a name, and be thought to have a colour, as being deeply black, yet is really, as is confeſſed, but a circular hole, whence no beams of light are reflected to the eye, as there are from the reſt of the tunicle it belongs to, which makes that part of the *uvea* or *iris* appear black.

This *uvea*, that hangs freely in the aqueous humour, does by its opacity ſerve for an internal curtain to cover as much as is requiſite of the cryſtalline humour, and fence it from too much light. And whereas in our teleſcopes, whoſe fabrick this age glories in, it is oftentimes requiſite to let in more or leſs light, as the object is more or leſs lucid or illuſtrated, and according to its diſtance, and perhaps other circumſtances, which oblige us to open

the tube, and change the aperture for a wider or a narrower: nature has provided for the eye far more commodiouſly, ſince the fibres of the *uvea* contract or dilate the pupil according to the exigency of occaſions, and this not only in a trice, and without our pains, but without ſo much as our intending to change the aperture, or even knowing that it does change. So that when too much light begins to break in upon the eye, that very light preſently occaſions the contracting of the pupil to exclude the exceſs of it. And when the object is but dim, or faintly illuſtrated, the pupil is much enlarged, to let in greater number of the beams of light; ſo that, eſpecially in young perſons, the pupil does upon very ſlight occaſions, and very often, vary its extent, as may be eaſily ſeen by what monſieur *Des-Cartes* judiciouſly obſerves, that if a *boy* be bid to look upon an enlightened window, and then to turn his eyes to ſome dark corner of the room, he that heedfully looks upon his eyes, ſhall ſee them upon the firſt mentioned occaſion contract the pupil notably, and on the ſecond, manifeſtly expand it, which I could eaſily confirm by auxiliary experiments, if it were proper to enlarge. But I ſhall rather obſerve, that a juſt breadth of the pupil does far more conduce to the compleatneſs of viſion, than moſt men are aware of. For if the *uvea* be *conſtantly* contracted a little too much, that diſeaſe is produced, that oculiſts call the conſtriction of the pupil: and on the other ſide, if the hole or aperture be *conſtantly* a little too wide, there follows an oppoſite diſeaſe, which they name *dilatatio pupillæ*, by which the ſight is much dimmed and impaired, as is well known to oculiſts and phyſicians. And indeed the neceſſity, or great uſefulneſs of ſeveral parts of the eye, may ſometimes be better manifeſted by diſtempers, that deprave them, than by the knife of a ſkilful anatomiſt. I have known a perſon, that after ſome accidents, that frequently enough recurred, was wont, for a conſiderable time, to ſee in objects other colours than naturally belong to them. And I lived in an houſe with another conſiderable perſon, whoſe eyes by a violent concuſſion of the head were brought to ſuch a tenderneſs of ſenſe and change of diſpoſition, that not only the light was very dazzling and offenſive to them, but for many days ſome ſorts of objects appeared adorned with divers, and thoſe too very vivid colours, of which other ſpectators could ſee none. And a famous writer related to me, that at the beginning of a dangerous fever, that he fell into, the bands and other linen of thoſe perſons that came near him, ſeemed to him beautified with the colours of the rainbow.

I REMEMBER a young gentlewoman, that by having her eyes, without any ſenſible defluxion or inflammation, diſtended, though uniformly, much beyond their natural dimenſions, was ſo incommodated, that though ſhe could ſee well the objects that were placed juſt before her, yet ſhe could not turn her eyes this way or that way to look on them; ſo that when ſhe read in a book, ſhe was fain to be perpetually moving it, to bring the words ſucceſſively right over-againſt the pupils of her eyes.

A VERY ſkilful oculiſt gave me an account of a patient of his, a very learned man, who ſaw objects double, which was very uneaſy and ſometimes dangerous to him, eſpecially becauſe in walking he ſometimes would run againſt a tree, or ſome other hard body, thinking that to be the illuſory one that was indeed the true one. Which diſtemper ſeemed to proceed from ſome inconvenient change in the ſituation and diſtance of the internal parts of the eye, which I the rather gueſs, becauſe another phyſician brought me the caſe of a patient of his, who upon a defluxion had ſome parts of his eye ſo ſwelled and changed, that he ſaw objects double: and yet this man was in no long time cured by phyſick, as was alſo (but more ſlowly) the learned man lately mentioned. And we may obſerve, that the unfit poſture of the eye, or even the improper motion of the viſive ſpirits, or of the fibres of the *retina*, or the optick nerve, may occaſion, as long as the cauſes laſt, the ſeeing of two objects inſtead of one. For that *phænomenon* may be eaſily produced by obliquating the eye with one's fingers, and is not ſeldom one of the effects that accompanies the irregular motions produced in the animal ſpirits and brain by drunkenneſs. It were eaſy to add inſtances; but I ſhall rather take notice, that the diſtempers of the eye may not only manifeſt the uſefulneſs of the parts they affect, but ſometimes make diſcoveries of ſome parts that are not wont to appear upon diſſection, though dextrouſly made. For though the tunicle, which ſome call *adnata*, and others *conjunctiva*, ſeem to be a very white and uniform ſubſtance in a dead eye, and even in a living one, yet in great *ophthalmias*, or inflammations of the eye, blood veſſels extremely ſmall, and on that account uſually latent, not only ſhow themſelves manifeſtly, but in ſuch numbers, as make the *adnata* look rather red than white. * * * *

To illuſtrate and confirm what I come from ſaying, I ſhall add (what I may perhaps have elſewhere mentioned) that there is a familiar animal, (viz. a white rabbit, whoſe eye being dextrouſly taken out, may help us to conceive how well the eye, as ſmall and as every way moveable as we ſee it, is framed to do the offices and many more of a darkened room. For when the eye of the little beaſt we ſpeak of was neatly taken out, and, after the optick nerve had been ſmoothly cut cloſe to the *ſclerotica*, was held between a competent light and the ſpectator, it was pleaſant to thoſe to whom I ſhowed the experiment, to ſee how prettily the neighbouring objects were painted at the bottom of the eye, whoſe *ſclerotis* (as being in this ſort of animals tranſparent) did not hinder the pictures that were made on the inſide of it, from being ſeen by thoſe that looked on the outſide. And particularly it was delightful to ſee the flame of a well ſnuffed candle held in a convenient

poſture, and at a due diſtance from the rabbit's eye and that of the ſpectator, vividly painted upon that region, where the optick nerve enters the bulb of the eye. And indeed it deſerves admiration, that ſo ſmall an optical inſtrument as a human eye, ſhould ſo far exceed a great darkened room, *not only* by its mobility every way, which makes it, upon the leaſt change of poſture, to exhibit in the twinkling of an eye, a new ſenſe of objects, perhaps very numerous and various, and ſome of them unequally but yet exceeding remote; *but* in the minuteneſs of ſome works framed by the help of it, and in the diſtance at which objects can be repreſented in it. This exquiſiteneſs of ſight does in *ſome* mens eyes far exceed what is to be found in the *generality* of men. *Cicero* tells us of one that wrote ſo ſmall a hand, that he ſhut up *Homer*'s Iliads, and that written upon a ſort of parchment, within the narrow bounds of a nut-ſhell, (which relation hath ſince given riſe to a proverbial ſpeech.) And not here to mention the ſtrangely minute and yet curiouſly framed bodies that I have ſeen myſelf, we have from unqueſtionable authority ſuch accounts of things framed or written in our age, by the help of a ſtupendious acuteneſs of ſight, that we need not be amazed at what is recorded of one *Myrmecides*, who, when *Rome* flouriſhed, was famous for having made a chariot ſo ſmall, that a fly framed of the ſame matter, could cover it with her wings; and a ſhip that a bee could hide with hers: it is pity we have loſt the memoirs of the excellent *Marcus Varro*, about rarities of this kind. But one thing is preſerved, which makes very much for my preſent purpoſe, namely, that one *Strabo*, that lived in the times of the Punick war, was endowed with ſo excellent a ſight, that he was uſed from *Lilybæum*, a Sicilian promontory, to ſee the Carthaginian fleet, when it ſailed out of the harbour (of *Carthage)* and that ſo diſtinctly as to be able to tell the number of the ſhips: nay, he adds, that the ſame perſon could well ſee a hundred and five and thirty thouſand faces. And it is the more credible, that here and there one man ſhould be able to ſee objects at an extraordinary diſtance, if that be true, which is delivered by ſeveral writers concerning the ſharp-ſightedneſs of the great nation of the Tartars: on which occaſion I remember, that the chief phyſician of the emperor of *Ruſſia*, having viſited me in his paſſage from his maſter's court to *Paris*, told me, (among other remarkable things) that frequently when the Ruſſian ſoldiers go out upon parties, they are careful to take along with them a Tartar or two, becauſe without ſuch an aſſiſtance, the Tartars would ſee the Moſcovites, before theſe could diſcover the Tartars.

Vid. Plin. H. N. lib. 7. cap. 21.

THE eye, which we have hitherto diſcourſed of, is a part manifeſtly organical, and generally looked upon as being curiouſly framed. And therefore ſince at the beginning of this article, I promiſed you, that in it I would make reflections on two parts of the body, I think it not unfit, that the other part which remains yet to be mentioned, ſhould be ſuch a one, that the excellency of its fabrick is not at all obvious, for which reaſon till of late it has been, if not with little diligence, at leaſt with little exactneſs, diſcovered by phyſicians and anatomiſts. And I ſhall the rather ſubjoin ſomething about the brain, to what has been lately obſerved about the eye, becauſe the main part of this organ, the optick nerve, does itſelf, like other nerves, proceed from the brain.

I SCRUPLE not then to ſay, that there is one part of the human body, the brain, which, when we compriſe under it (as we may) the *cerebellum* and *medulla oblongata*, and compare its ſoft conſiſtence and the ſtructure that its excellent functions and uſes argue it to have, challenged a peculiar mention and regard, and on that account a place in this article. For though the ſoftneſs of the brain make it unfit to be diſſected like muſcles and other firmer parts of the body, whence anatomiſts tell us but of two main parts diſtinguiſhable in its ſubſtance, namely the white and the aſh coloured, or as ſome call it, the cortical and the cinereal, for the four ſinuſes of the brain are not proper and ſubſtantial parts, but cavities (opening into one another) and receptacles of tranſient fluids; *yet* there muſt be in the brain and its *appendix* the *cerebellum*, far more of mechaniſm than is obvious to a vulgar eye, or even to that of a diſſector. For though this ſeemingly rude lump of ſoft matter does for colour and conſiſtence look almoſt like ſo much cuſtard; yet there are ſuch ſtrange things performed partly in it, and partly by the animal ſpirits that it produces, and ſends, through the nerves that proceed from it, to other parts of the body, that we may rationally conceive that its ſtructure is not more difficult to be *diſcerned* than worthy to be *admired*. For *firſt*, the brain taken in the large and popular acception of that name, is by philoſophers held to be the ſeat of what they call *common ſenſe*: becauſe the nerves, that terminate at one end in the organs of particular ſenſes, as the eye, the ear, *&c.* do at their other extremes, terminate, and as it were loſe themſelves in the brain, which by this means becomes the rendezvous (as it were) of the ſeveral ſenſories, whereto thoſe ſinews reach, and make it the ſeat of that faculty, which *both* diſcerns thoſe objects of ſenſe that are called common, becauſe they are diſcoverable by ſeveral ſenſories, as magnitude, figure, motion, *&c. and* diſtinguiſhes the proper objects of one particular ſenſe from that of another, as light from ſound, and heat from taſte. The brain alſo *(ſecondly)* is the ſeat of that other faculty of the corporeal ſoul, that we are wont to call *imagination*, becauſe it exhibits the images as it were of ſenſible things, which are variouſly contracted, enlarged, divided, compounded, or otherwiſe notably altered by this faculty, which often dreſſes up ſuch a large variety of corporeal *ideas* and fantaſms, and both ranges them and makes them ſucceed one another in ſuch manners, as makes the

fancy a moſt ſtrange and many times oddly furniſhed *ſcene*, incomparably ſurpaſſing for variety and extravagance, all the machines deviſed for theatres, operas, and maſks, as may particularly appear in the wild ravings of maniacal and hypochondriacal mad-men, and oftentimes in the dreams of ſound men, but much more in thoſe whoſe brains are heated and agitated by fevers.

THAT (*thirdly*) the brain is that part of a man, wherein the human mind or rational ſoul does peculiarly reſide, and exerciſe its power; is the moſt received opinion among philoſophers, phyſicians, and divines too. And the Carteſians among the moderns confine the ſeat of the immaterial part of man, to a determinate and but ſmall portion of the brain, *viz.* the *conarium* or *glandula pinealis*, which yet, according to them, has a great connexion with the other more conſiderable parts of the brain and cerebellum. I need not enlarge upon this great prerogative of the brain, that it is the manſion of ſo noble and excellent a reſident, ſince ſuch ſpeculations would require far more time than I can ſpare; and ſince alſo the knowledge that the brain, or ſome part of it, is qualified to be a fit inſtrument for the exerciſe of the faculties and functions of ſo noble and excellent a being as the human mind, may perſuade a conſidering man, that it muſt have an excellent ſtructure or organization.

In the fourth place, that the brain is likewiſe agreed upon by moſt of the moderns, as well as many of the ancients, to be the workhouſe, wherein and whereby the animal ſpirits, that ſerve for ſenſe and motion, are continually by filtration, exaltation, or otherwiſe, elaborated or produced.

Fifthly, it is likewiſe the received opinion of naturaliſts and phyſicians, that the brain, and, as many hold, one part or region of it is the ſeat of memory, and indeed I have known perſons eminent for parts, whereof one by a fall from a horſe, that ſhook his brain, did in a trice loſe the memory of what had juſt before happened to him, and did not ſo much as know his own mother, who came to ſuccour him, though otherwiſe he had his ſenſes and his ſpeech as free as before, and the other perſon, though more than ordinarily free from tranſports of any paſſion, did in a few minutes by (as far as could be judged) a bare invaſion of that part of the brain where memory chiefly reſides, forget the very names of her near relations when mentioned to her, and of domeſticks when I brought them to her; and though ſhe talked good ſenſe to me of ſeveral things, yet ſhe did not, that I could perceive, make uſe of her memory, which but ſome minutes before I had at parting from her, left very ſound and good. But whatever were the cauſe of theſe accidents, memory ſeems to me a faculty wonderful, and whereof the modus is ſo difficult to conceive, that if experience did not convince us of it, and the inſtances of it were leſs familiar to us, I am perſuaded, that many conſiderate men would think it impoſſible or inconceivable, that there ſhould be ſo unaccountable a corporeal faculty. If we look upon a learned man that is ſomewhat aged, and conſider, that being a linguiſt, he muſt remember I know not how many thouſand diſtinct words, many of which, eſpecially nouns and verbs, are each of them much varied by differing terminations and accents; when I conſider the ſame perſon as a philoſopher and a mathematician, an anatomiſt, a chemiſt, and perhaps ſo general a ſcholar as to be verſed in ſeveral other diſciplines, and when I conſider the ſame perſon as having lived ſixty years in the world, and during that long tract of time, ſeen and heard, and read and ſpoken, and done and ſuffered a vaſt multitude of things; when I ſay, I conſider ſuch things as theſe, I cannot but be amazed how it is poſſible, that in ſo ſmall a portion of matter as the memory is ſeated in, there ſhould be ſo many thouſands or myriads of diſtinct traces, footſteps, impreſſions, or whatever you pleaſe to call them, lye not only unconfounded, but ſo diſtinct, that at the bare will and pleaſure of the learned man, we ſpeak of, any of this vaſt multitude of exceedingly various things, will, as it were, ſtart up and manifeſtly appear, and if it were a hiſtory, or matter of fact, will be preſented to the view of the mind with the ſeveral circumſtances of time, place, colour, and other circumſtances that then accompanied it, and that in the right order they firſt occurred in, and thereby renew an idea like that which was, perhaps, many years before produced. Theſe reflections, though they be but a part of divers that may be made to the ſame purpoſe, may, I preſume, ſerve to perſuade us, that there muſt be a moſt exquiſite and indeed an amaſing ſtructure in a ſoft body, that in a little room can afford diſtinct traces or cells as it were to ſo vaſt a multitude of things as are crouded into and yet commodiouſly lodged in a portion of the brain, and that ſo durably, that after forty or fifty years they may be at pleaſure brought to appear before the mind, or when by ſome accident, as by a book, or a dream, they are excited, the mind is made ſenſible, that the things repreſented were formerly at ſuch a time committed to the memory.

IN the ſixth place, it is in the brain, that the organs of the particular external ſenſes of ſeeing, hearing, *&c.* have their general rendezvous, and if Mr. *Des-Cartes* and thoſe phyſicians and anatomiſts that follow him be not miſtaken (for I ſpeak but conditionally) the reports, that all the differing ſenſories bring to the mind, are made in a part of the brain, *viz.* the conarium, or glandula pinealis, that in reſpect to the reſt of the brain, is inconſiderable for bulk. But not to examine this new opinion, ſince in the brain, or ſome part of it, the actions of all the outward objects upon our organs of ſenſes are, if thoſe actions be vigorous enough, diſtinctly received, the brain muſt be capable of being affected in almoſt innumerable different manners. For to omit the manifold actions of the other three ſenſes, it is plain, that the organ of hearing

tranſmits

tranſmits a ſtrange multitude of differing motions, that produce ſo many ſounds; for beſides the whiſtling of winds, the claps of thunder, and other noiſes, that man contributes not to excite, and the many differing ſounds that we owe to muſick vocal and inſtrumental, there is a kind of ſounds that ſeldom uſes to be reflected on, which in my opinion deſerves our wonder, both for their multitude and their variety. For it may juſtly ſeem ſtrange to him that duly conſiders it, that that particular kind of ſounds, that when they proceed from men are called voices, ſhould be ſo very different, that notwithſtanding the multitude of perſons, which a man, that has occaſion to have much converſation in the world, is wont to exchange words with, there is ſcarce ever any one, that he cannot by his voice diſtinguiſh from every other that he has held diſcourſe with, and this though the ſame party ſpeaks ſometimes louder, ſometimes lower, ſometimes faſter, ſometimes ſlower, *&c.* And it is not a little ſtrange, that with very few exceptions, if any, one may very well diſtinguiſh the voice, whether the perſon that he hears, but does not ſee, be a man or a woman, notwithſtanding the almoſt numberleſs differing voices that each of the ſexes affords. Nay there are many that can readily diſtinguiſh perſons that they are well acquainted with, but do not ſee, even by ſuch ſounds as they do not form by their vocal organs, as by the noiſes they make when they walk in a room or knock at the door. Nay, there are ſome watermen that will know their acquaintances in a dark night, merely by the noiſe made by their oars ſtriking on the water, of which I ſomewhere mention inſtances.

* * * Since the *medulla oblongata*, that is ſeated within the ſkull, is one of the three great parts that belong to the brain, and is the common root of the nerves that miniſter to ſenſe; and ſince the *ſpinalis medulla* (or as ſome call it, *dorſalis*) is looked upon but as a continuation of the *medulla oblongata* newly mentioned, and reaching thence all along the cavity of the ſpine, whence at ſo many perforations curiouſly made by nature, part on one ſide, and part on the other, it emits thirty pair of nerves, that convey motion to various parts of the body; ſince, I ſay, theſe things are ſo, we cannot think it ſtrange, that our anatomiſts ſhould judge the brain to be the principal ſource of motion, or as learned men are wont to expreſs it, the ſeat of the locomotive faculty.

Now this being ſuppoſed, I think it may much and juſtly conduce to make us judge the brain taken in a lax ſenſe to be a wonderful part, even without conſidering what ought to be held about the opinion of many learned anatomiſts and phyſicians of our times, that make the ſinews ſubſervient to the nutrition, as well as motion, of divers parts of the body. For the locomotive power alone may ſuffice to challenge our wonder; ſince philoſophers themſelves may juſtly admire, that ſuch minute and inviſible corpuſcles as the animal ſpirits, and thoſe too, in no greater numbers than can be furniſhed by and contained in the brain and inconſpicuous cavities of the nerves, even ſuppoſing thoſe parts aſſiſted by ſome ſmall portion of liquor to make exploſions, ſhould be able to move all the outward limbs and internal muſcles of the body, in ſuch various manners, and with ſo much agility and ſtrength, as we ſee they do in divers luſty and active men, and more particularly in ſome dancers on the ropes here among us, who themſelves are far exceeded in nimbleneſs and ſprightlineſs by ſeveral of the ſame profeſſion in the *Eaſt-Indies*, as not only credible authors inform us in their printed voyages, but moſt credible eye-witneſſes of our own nation now alive, have aſſured me.

* * * We ſhould be far more ſenſible than we commonly are, and make a juſter eſtimate than we are wont to do, of the great wiſdom and artifice, and of the beneficence that are exerciſed in the fabrick and contrivance of the numerous and various parts of a human body; if we were ſufficiently aware of, and did duly conſider what things both for number and quality are requiſite to make this or that part as well qualified *to* maintain itſelf, *to* perform all its own functions, *to* prevent inconveniencies or ſurmount them, and *to* be ſerviceable to the body it concurs to conſtitute, as really it is. Thus, for inſtance, a bone ſeems to moſt men to be a very plain and inartificial thing, ſcarce ſuperior to a wooden leg of an ordinary ſtool or chair, which as well as the bone is endowed with ſolidity and a determinate ſhape. But he will have more advantageous thoughts of a bone, that conſiders three or four things that belong to it; whereof the *firſt* is *the ſhape* of it, which a ſkilful inſpection will ſhow to be far more artificial than at firſt ſight appears; in regard of the various kinds and degrees of protuberances and depreſſions, ſuch as are called *apophyſes*, *epiphyſes*, &c. with reference to the ſeveral muſcles that have their heads, or their tendons, faſtened to it, in the moſt advantageous manner that mechanical ſkill could direct. And to the ſhape may be referred the length and the deſigned uniformity in the thickneſs of the bone. It is worth conſidering (in the ſecond place) *that* theſe bones in children and youths muſt continually grow for many years, and that in all their dimenſions, and ſo likewiſe muſt the cavities that lodge the marrow; to which conſideration muſt be added, that the heat of the blood and other parts of the body continually tends to diſſipate the matter of the bones, and by driving off the more volatile parts renders them dry and brittle; ſo that it is neceſſary to prevent this miſchief, that nature provide them with perpetual ſupplies of aliment, and that oily or unctuous enough; that the bone may be kept moiſt by an alimental juice, ſuitable in its qualities to the needs of the part; and as this aliment muſt be conveyed by certain channels, as arteries and veins, ſo theſe muſt be able to penetrate, though oftentimes latently, the body of the bone as ſolid and hard ſoever as it is. For if the bone were otherwiſe figured,

and were not furniſhed with ſuch veſſels as uſually are not ſeen in it, and by their means with a conſtant ſupply of juices proportionable to its nature and needs; a bone would not be able to perform its functions *well* and *long*, but would be ſoon ſpoiled or rendered inſufficient for its deſigned uſes. Divers other parts of the body may afford better inſtances to our purpoſe than bones, whoſe mention I pitched upon, not becauſe I think them the *moſt*, but becauſe they are looked on as ſome of the *leaſt* elaborated parts of the body. And indeed the provident author of nature has deſtinated moſt of the parts to ſuch different functions and uſes, that if he had not likewiſe with admirable foreſight obviated the impediments and inconveniences that would otherwiſe attend their firſt formation, and ſettled a courſe to give them continually freſh ſupplies to maintain them in their natural ſtate, they would quickly fall into decay, and loſe the conſtitution neceſſary to their being ſound and uſeful.

Article IV. THE parts of a human body ſeparately conſidered, are, as we have lately ſeen, ſo curiouſly framed, as to deſerve to paſs for excellent pieces of workmanſhip. But when in the body, that is made up of them, they are conſidered in their entire ſyſtem, and as they are by a due ſituation and mutual connexion, aſſociated, or rather united into one great organical body, they appear in this condition with great advantage: and the human engine conſiſting of ſo many differing parts moſt aptly put together, acquires by this ſtate of entireneſs, a new title to our eſteem and wonder. So that we may apply to the microcoſm, that paſſage about the macrocoſm, wherein the ſacred hiſtorian relates, that God ſaid of the particular works of the ſix days creation, that he ſaw that this and that work was good; but when he came to ſurvey the aggregate of them all in their entire ſyſtem, the hiſtorian adds with an *ecce*, to excite our attention, that *all that he had made was very good* *.

* Gen. i. 31.

THAT the human body is greatly advantaged by the ſkilful aſſociation of its parts, would manifeſtly enough appear, if we had leiſure to diſplay divers properties that reſult from it, or depend on it, ſuch as are, 1. The connexion of theſe parts. 2. Their ſituation. 3. Their ſubordination. 4. Their mutual ſubſerviency. 5. The ſtrength and agility ſpringing thence. 6. The ſymmetry, and comelineſs or beauty obſervable in the ſyſtem of them. And 7thly (and laſtly) the ſtrange conſent of ſome parts in reference to ſome others. But to diſcourſe of each of theſe as it deſerves, would too much exceed the bounds of our fourth article, as well as of the time allowed me to diſpatch it in; and therefore I ſhall only curſorily paſs over them again.

Numb. 1. THE ſtrict connexion of ſuch a multitude of parts differing in conſiſtence, bulk, figure, ſituation, functions, *&c.* as, in a little room, make up the human body, may juſtly, to him that conſiders it, appear the effect of a wonderful ſkill, and he that in a curious diſſection ſhall obſerve *how* aptly the ligaments are placed where they are neceſſary to faſten the parts together, *how* ſkilfully they are ſhaped for their reſpective offices, and *how* juſtly their ſtrength is proportional to the works they are to perform, will think, that the wiſe opificer did not only make a full proviſion for the uſes to which he deſtinated theſe ſeveral ligaments, but was alſo careful to huſband the matter he made uſe of to frame the body, ſo as no more of it than was neceſſary ſhould be employed about any of its parts. And it is worth obſervation, that divers of the tendons of the muſcles, which in ſome parts ſerve to faſten, as well as the ligaments more properly ſo called, have a peculiar texture that makes them wonderfully ſtrong, in compariſon of our factitious cords of the ſame bigneſs, as may be ſeen in the ſtalls of butchers, where oftentimes the body of a fat hog, or an ox, is kept ſuſpended by the ſtrength of natural cords, that one would think far too ſlender to ſupport ſo great a weight. And this ſtrength will further appear, when we come to the fifth number.

THE ſeveral parts thus firmly joined to each other, are not yet confuſedly bound together without order, as in a bundle, but are all of them ſo diſpoſed of, that each of them has obtained the moſt convenient ſituation it could be placed in; which advantage is oftentimes much aſſiſted by the ſhape or figure of the part, which makes it capable of being placed there, without prejudicing any of the contiguous parts. He that has obſerved the ſeveral parts of a human eye, will eaſily be convinced of how great moment the determinate ſituation of every one of them is to the compleatneſs of the organ; ſince even a ſmall change in their ſituation may deprave or very much impair the act of viſion. The ſituation of the ſphincters, (or muſcles that contract themſelves circularly towards the centre) this determinate ſituation, I ſay, of the ſphincters that belong to the *inteſtinum rectum*, and the urinary bladder is ſo fit and ſo neceſſary, that without it, the animal would be almoſt perpetually annoyed with the involuntary, naſty, and offenſive diſcharge of his own excrements; which by means of theſe ſphincters ſo appoſitely ſeated, he can (for a great while) retain or diſcharge at diſcretion. The valves of the heart are not only admirably figured for the functions they are to perform, but they are no leſs ſkilfully ſituated for the reception and diſcharge of the blood, that is to paſs through the heart, and for the tranſmiſſion of it from the veins into the arteries, and the return of it into theſe, and ſo for the maintenance of a circulation ſo neceſſary to life, that the ſtopping of it but for two or three minutes, does oftentimes in a trice put an end to it. And though the muſcles do not, to vulgar ſpectators, ſeem to be very curiouſly placed, yet *when* they are, by a ſkilful diſſector, well raiſed, and the ſhape, bigneſs, ſtrength, *&c.* of particular muſcles, and eſpecially *when* their originations and inſertions (which are things referable to ſituation) are heedfully conſidered, and compared with their ſituation

Numb. 2.

in reference to the bones and the different parts of the bones, (as knobs, cavities, edges, *&c.*) they are ſeverally faſtened to: and further, *when* theſe alſo ſhall come to be compared with the rules of mechanicks, and eſpecially thoſe that deliver the nature and properties of the three ſeveral kinds of levers: when I ſay, theſe collations ſhall be duly made, you will find cauſe to admire the excellent mechaniſm that is employed in ſo advantageouſly ſeating ſo many muſcles differing in bigneſs, ſtrength, ſhape, *&c.* as are to be found in the muſcular parts of a human engine. * * *

The particulars mentioned in the ſeven foregoing articles, may ſerve to give you a juſt admiration of the divine architect of ſo curious a fabrick as an human body, conſidered in its entire ſyſtem, appears to be. But yet I muſt own to you, that there are divers other things as fit perhaps as thoſe lately diſcourſed of, to juſtify, if not alſo to heighten, this admiration. That you may not think this aſſertion altogether groundleſs, I ſhall here curſorily touch upon three or four things that now come into my thoughts. And *firſt*, it is remarkable, that, where it could be done without prejudice to higher ends, the wiſe and beneficent author of human nature has made ſome very noble and uſeful parts of the body *double*. Thus though a man may not only *live*, but *ſee* well enough with one eye, yet God has furniſhed him with two eyes, both to relieve one another; and that in caſe one ſhould be made uſeleſs by ſickneſs or outward accidents, the other may ſuffice for viſion: as many who have loſt one of their eyes, daily find to their great comfort. And in like manner, and upon the ſame accounts, man is furniſhed with two ears, and two hands, each of which may, for a need, perform moſt of the functions of both.

2. It deſerves a grateful reflection, though little, or none be wont to be made upon it, that of the ſmall number of features and colours, that ſuffice to make up the face of a man, providence has made ſo many combinations, and hath thereby ſo diverſified the faces of men and women, that of about eight hundred millions of human perſons, which, by the likelieſt eſtimate I can make, mankind conſiſts of; it is very hard, and ſcarce poſſible, to find two, whoſe faces are not, in ſomething or other, unlike enough to make the perſons they belong to diſtinguiſhable. For if it were not for this difference, what miſtakes and confuſions do you think, the want of it would occaſion among men, and in human affairs?

3. The like reflection may be made upon the innumerable differing combinations, that ſo diverſify a few notes, or ſounds into the voices of ſome hundreds of millions of men, women, and children; that it is very rare to meet with two perſons, that are not eaſily diſtinguiſhable by their voices, whoſe too great reſemblance would beget ſtrange confuſions. On this occaſion, I remember, that I was well acquainted with an illuſtrious family, wherein two ſiſters, beſides a great reſemblance in features, were ſo much alike in their voices, that when I took notice to their mother, how difficult I found it not to miſtake one for the other, ſhe told me, that ſhe herſelf was not exempt from being puzzled by ſo near a reſemblance; ſo that ſometimes when they were behind her, ſhe was obliged to turn her face towards them, that ſhe might diſcern by her eyes (what her ears could not diſcover to her) which of her two daughters were the ſpeaker.

The mention I come from making of voices and words, forbids me ſilently to paſs over a conſideration of the chief inſtrument that frames them, I mean the tongue. For this little part is ſo ſkilfully contrived, that it ſerves excellently for uſes of very diſtant natures; of which the part that it has in human ſpeech is but one, though indeed a main one. For the tongue is the chief organ of taſting, being inveſted with a ſkin ſpongy and full of little teats, which makes it very fit to imbibe the ſaline or ſapid corpuſcles of taſted bodies, and convey them to the nerves, by whoſe intervention we have diſtinct ſenſations of far more ſapors than we are yet able to give names to. The tongue alſo by its volubility and manifold flexures, diverſified in a trice, as occaſions (perhaps a thouſand in leſs than an hour) may require, does ſerve for a living and ſupple *ſpatula* to turn and roll too and fro the meat in the mouth, to expoſe it to the teeth, and to help it to be afterwards ſwallowed, with a ſalivary *menſtruum* by the throat. But that which engages me to mention it here, is the great and neceſſary uſes it is of in the formation of the voice and articulate ſounds, or words, which, conſidering the variety of languages, are ſo different and numerous, that nature had need to croud into this little organ of ſpeech, a great diverſity of parts, ſuch as, beſides the ſkin above-mentioned, the veins and arteries, and a peculiar ſort of fleſh, and the nerves that it receives from more than one conjugation, ſeveral muſcles that partly belong to that heteroclite bone, the *os hyoides*, and four pair of muſcles of its own, to give it that great variety of motions and flexures, that are requiſite to the performance of its manifold functions, and eſpecially to the ſpeaking of ſeveral languages.

Something like what has been conſidered about the diſſimilitude of mens voices, may be alſo obſerved in the diſtinguiſhableneſs of mens hand-writings, notwithſtanding the paucity of the letters of the alphabet, and of the lineaments neceſſary for writing, and the vaſt multitudes of men, women, boys, and girls, that employ pen and ink to expreſs their thoughts. * * *

When I was come thus far, (*viz.* to the conſideration of a living body) ſickneſs and inevitable, as well as diſtracting avocations, that had before interrupted me ſomewhat favourably, fell ſo thick upon me, and reduced my intervals of leiſure to be ſo few, ſo uncertain, and ſo ſhort, that I am not able in the intended remaining part of this diſcourſe, to inſiſt

inſiſt as much (though that be too little) as I have done in that which you have already peruſed. And therefore I hope you will not think it ſtrange or unpardonable, that in the proſecution of my taſk, I do not (as I intended, and as I confeſs the ſubjects deſerve,) enlarge upon every head of diſcourſe that I ſhall mention. For my occaſions permit me at preſent to *do little more than name divers of them*, and oblige me to defer the intended comments and enlargements, till God ſhall pleaſe to vouchſafe me better opportunity to purſue my firſt deſign.

And that you may not be ſo ſurpriſed to find the following papers ſo incoherent, and the ſeveral bundles or parcels of them ſo very diſproportionate in point of bulk to one another, I muſt beg leave to inform you, that for certain reaſons (that you may eaſily gueſs at) I did not think fit to write all the *ſecond part* of the Chriſtian Virtuoſo in one continued *ſeries* of diſcourſe, without touching upon any other ſubjects of thoſe that remain to be treated of, till I had quite diſpatched thoſe, that, by the laws of method ought to have been firſt finiſhed, and to precede it. So that when the forementioned diſcouragements ſurpriſed and oppreſſed me, I had at my diſpoſal *ſome*, (and but *ſome*) of the many looſe memoirs and ſhort notes, that I had formerly provided as materials to be employed in the *ſecond part* of the above named treatiſe. But coming to ſurvey, and bundle up the ſeveral ſcattered papers, I could light upon, that mainly conſiſted of theſe incoherent *memoirs*, I found, that the parcels they would be fit to conſtitute would be exceeding unequal. For *ſome* of the particular heads of diſcourſe had very few notes, or *memoirs* relating to them; whereas to ſome *other* heads, I found papers enough to furniſh divers little bundles, (though ſome conſiſting of more, and ſome of fewer notes,) fairly enough referable. This put me into ſome perplexity how to diſpoſe of theſe papers. For to ſend them you as they were, would be to trouble you with a *chaos* inſtead of preſenting you with a diſcourſe; and not only diſparage the writer (which were a very ſmall miſchief) but (which is far worſe) injure the ſubject. And on the other ſide, this very nobleneſs and uſefulneſs of the excellent ſubject, that made it deſerve a compleat and elaborate diſcourſe, made me ſcruple to let any thoughts periſh, that, though very imperfect and incoherent, might conduce to illuſtrate or to recommend it. And therefore, *though* I dare not ſuffer my remarks and reaſonings to appear ſo much to their own and the deſign's diſadvantage, as they muſt do, if they ſhould pretend to compoſe an entire body of diſcourſe; *yet* becauſe hereafter, if God permit, the *chaſms* may be filled up; I thought fit, leſt the looſe notes wherein my thoughts had been at different times ſet down, ſhould be loſt, (as many others had been) for want of being bundled up together, I did, I ſay, think it not amiſs they ſhould accompany the firſt, or initial papers of ſeveral ſections or ſubſections, that I had already begun, and intended that theſe looſe ones ſhould join with others to enlarge. And becauſe I had not time to ſelect carefully, and range orderly all thoſe that lay confuſed in a heap of theological notes, and memoirs about ſeveral ſubjects, I choſe to take in, for the preſent, rather ſeveral that perhaps did not in ſtrictneſs belong to the *Chriſtian Virtuoſo*, than throw by any that did. Upon which account ſeveral, that formerly were drawn out of ſome other long neglected diſcourſes were retained, that among thoſe, that ſhould be found coincident, or very near of kin, the fitteſt might be choſen, and others, that are capable of being made tolerably fit, by due connexions and retrenchments, may be made ſome uſe of.

To conclude, you will find, that the little collections or bundles of notes laid together for the ſeveral ſections and ſubſections for the remaining part of this tract, and are for the moſt part lodged in diſtinct paper-caſes, do conſiſt, moſt of them, of an introductory paper or two, and of ſeveral *memoirs* or notes, ſome longer, and ſome ſhorter, that accompany them, in the ſame bundle, to which they appear to appertain. And to theſe I ſubjoin in a diſtinct paper-caſe, a larger, and miſcellaneous collection of particulars, of which thoſe which ſhall be found no way pertinent to the *Chriſtian Virtuoſo*, are to be laid aſide, and the reſt may be referred to the reſpective heads or ſubjects, whereto they ſhall be judged, the moſt properly, to belong.

What has been hitherto obſerved about the carcaſe of a dead man, may, I think, ſuffice to ſhow, that even that is a curiouſly framed and excellent engine. But I muſt now add, and endeavour to manifeſt, that it is almoſt incomparably inferior to that excellent, nay matchleſs engine, a living human body. Since whilſt a man is truly and properly ſaid to *live*, many affections belong to his corporeal part, or are performed in it, or by it, that make this *automaton* called his body, much, and very advantageouſly, differing from a mere cadaver. * * * *

We may therefore conſider the wiſdom expreſſed by the author of nature in a living body, by ſuperadding to the particulars formerly mentioned, as belonging to a dead one, ſuch as theſe that follow, viz.

1. The various local motions of a living human body, and its parts, (abſtracting from the difference of ſexes.)

2. The ſenſations of ſeveral ſorts, both external, as ſight, taſte, *&c.* and internal, as hunger and thirſt, which belong to a living body.

3. The functions that belong to the ſoul of a man, as he is an animal, as imagination and memory, diſtinct from intellectual operations.

4. The ferments, or principles analogous to them, that are ſuppoſed to be lodged in particular parts.

5. The chemical operations that nature exerciſes in a living body, eſpecially in the liquors and other fluids it contains.

6. The

6. THE care that is taken for the propagation of the *ſpecies*, both *in* deſtinating peculiar parts for that only purpoſe in each ſex; and *in* furniſhing both at fit ſeaſons with venereal appetites, and in giving the mother ασοργὴ, and furniſhing her with aliment for the *fœtus*, both in the womb, and whilſt it is to ſuck.

7. THE admirable and ſcarce comprehenſible *formation of the fœtus* in the womb, eſpecially when it is very like the parents, and has permanent marks of the mother's longings, or frights, and is ſubject to her's or the father's hereditary diſeaſes in body, or mind.

8. THE inſtincts and other deſignations and inſtitutions appointed, by the great mechaniſt, for the welfare of the animal, in its ſeveral ſtates and circumſtances of life.

* * * * * SUPPOSE one of thoſe Jeſuits that firſt carried curious watches into *China*, had been caſt away, with one of them in his pocket, upon one, or other of thoſe many iſlands, that are in that vaſt ocean inhabited by people, though civilized, yet unacquainted with European inventions. Though one of the more judicious and ſkilful of them, upon the bare ſuperficial view of the rich materials, fine ſhape, enamellings, and other embelliſhments of the caſe and dial-plate, would preſently conclude, that this ſo fine box was not made by chance, but by ſome ſkilful workman; yet he would by no means have ſo good an opinion of the artificer, as when having opened the caſe, he ſhould ſee ſo many wheels and other parts curiouſly framed and cut, and exquiſitely adapted to one another in ſuch manner, as to give him a ſtrong ſuſpicion, that this ſmall, but exquiſite engine was deſigned for ſome conſiderable uſes, and made very fit for them. But if, afterwards, another of the fathers, that had eſcaped from the wreck, and been driven aſhore upon a plank, ſhould wind up this watch, whoſe parts before lay moveleſs; and let him ſee how the balance, the wheels, and other parts, conſpired not only to ſhow, and ſtrike the hour of the day, but alſo at ſet times to give an *alarum*: and to ſhow alſo the day of the week and month, the aſpect of the planets, the faces of the moon, the changes of tides, in the place it was made for, and thoſe other ſingular, and uſeful things that we have ſeen capable of being performed by a very curious watch: ſuppoſing, I ſay, the watch wound up, the contemplation of the engine, thus in motion, would give the amazed beholder an incomparably more advantageous *idea* both of the machine and the mechaniſt, that could foreſee, and pre-ordain ſuch various things, and croud into ſo ſmall a room, all the things that are neceſſary, and as many as are ſufficient to produce ſuch various phænomena and uſeful effects. And ſo, he that conſiders the body of a dead animal, wherein the immediate motions, and agents that entertain life, and the vital functions, and wherein perchance they conſiſt, *&c.*

* * * * * IN the admirable engine of a human body, beſides the *ſolid* parts, as bones, and the conſiſtent ones, as veſſels, nerves, *&c.* There are a good many *fluids*, ſome manifeſt to the ſight, and others too ſubtile to be diſcovered by it. And though the ſolid, and conſiſtent parts of a lifeleſs human body, that have hitherto been the objects of our reflections, be the moſt conſiderable; yet the fluid parts are ſuch, both for the *quantity* of ſome of them, and the *number*, *variety*, and *uſes* of others, that they are too important to be altogether pretermitted. Theſe fluids may be divided into viſible and inviſible: of the *former* kind, blood, chyle, and other viſible liquors, and theſe of differing ſorts, as *ſerum*, *gaul*, *lympha*, *ſuccus pancreaticus*, &c. And of the *latter* ſort are thoſe ſubtil and active corpuſcles, that make up the unſeen fluids that paſs under the names of vital and of animal ſpirits; whence are derived, both many of the functions neceſſary to life, and alſo thoſe various ſenſations and local motions, that give man, as he is an animal, the chief prerogatives he has above plants, metals, *&c.*

* * * To all that has been ſaid, I ſhall add one thing more, perhaps, of no leſs importance than any of the reſt. For I conſider, that the knife even of the moſt ſkilful and dexterous anatomiſt, eſpecially if he diſſect but dead bodies, can never ſufficiently acquaint us with the curiouſneſs of the contrivance of a human body. For all that anatomy can do, is to manifeſt or diſplay the ſtructure of the *conſiſtent parts*, ſuch as the bones, cartilages, nerves, arteries, veins, *&c.* and expoſe to our ſenſes the *viſible liquors* of the body, ſuch as blood, gall, the concreted juices, urine, *&c.* But it cannot ſhow us either of the two ſorts of inviſible parts, *viz.* the *animal* and other *ſpirits*, and the *ferments*, (or principles analogous to them) that may reaſonably be ſuppoſed to lodge in the ſtomach, kidneys, and other particular parts. And yet the influences and operations of theſe are ſo conſiderable, that I am apt to think, that moſt of the parts of the groſſer body ſeem intended by nature, but as a kind of kitchens to dreſs the aliment, and make its finer parts pure and ſubtil enough to become animal; or if you pleaſe, *hormetick* or impulſive *ſpirits*, fit to actuate the brain and nerves, and thereby to become the grand inſtruments of ſenſe, motion, and imagination. * * *

THE curious works of men have been brought to their perfection, ſuch as it is, not by being framed at firſt, according to an original and compleat idea, but by ſeveral helps, additions, and corrections, that the artificers were, from time to time, led to, by the unforeſeen inconveniences and imperfections that unwelcome experience did, from time to time, diſcover to them, as needing remedy or ſupply, as may appear by ſeveral of the curioſeſt productions of human art, and particularly (to omit watches, clocks, *&c.*) in the building of a ſhip fit to make long voyages. For this curious, floating machine was not made at firſt by mere human induſtry, any thing like what it is now come to. But floating veſſels, from troughs or hollowed trees, have

have by many changes and degrees, corrections and ſupplements, made ſo ſlow a progreſs towards the comparative perfection that is now attained, that many ages have been buſied before naval architecture could be brought to the paſs it is now at: whereas a human body, for inſtance, though an engine incomparably more both compounded and exquiſite, was in the firſt protoplaſt made ſo compleat, becauſe exactly conformable to the original idea of a divine opificer, that in all the ſucceeding ages there has been no need to correct any thing, as being amiſs, or add any thing by way of ſupplement to the omiſſion, or want of any thing belonging to its due perfection.

THAT the rational ſoul, or immaterial mind, is the chief and nobleſt part of man, none, that deſerves that title, will deny. Many heathen philoſophers themſelves looked upon the rational ſoul, as not only a , but, as it were, a part (or as they term it ἀπόσπασμα) of God, and others make it to be indeed *the man*, and the human body to be but *the manſion*, or, as they uſually ſpeak, *the* vehicle of it. And perhaps it were worth conſidering, whether this notion be not favoured by thoſe expreſſions of St. *Peter*, where he
2 Pet. i. 13, 14. ſays to the diſperſed Chriſtians, *I think it meet, as long as I am in this tabernacle*, (which term St. *Paul*, more than once, uſes to ſignify the body) in which paſſage, the word *I* is plainly diſtinguiſhed from the other, as an inhabitant from a manſion. And, within two or three lines after, he employs this expreſſion, conſonant to the firſt, *ſhortly I muſt put off this my tabernacle*; wherein he, again, clearly ſpeaks of the body, he was to leave, as of a *poſſeſſion* belonging to that which was properly *himſelf*.

SINCE, as I more than once advertiſe you, I do not in this diſcourſe pretend to treat of my ſubjects, either abſolutely or fully, but only ſo far forth as ſome inſpection into theſe works of God, tends to give us more numerous and better grounded motives to glorify him for them: I ſhall not, in this place, think myſelf obliged to treat of the rational mind of man, as it is diſtinct from the body, merely like a naturaliſt; but conſider ſome things about it, that may juſtly paſs for peculiar excellencies, that deſerve we ſhould admire and
Heb. xii. 9. gratefully celebrate for them, *the Father of ſpirits*, as the ſcripture ſtiles the Almighty Creator.

THE things, that here challenge a particular conſideration, though I can allow them but a brief and tranſient one at preſent, are theſe. 1. The ſpirituality, or immateriality of the human mind. 2. Her cogitative nature. 3. Her rationality. 4. Her freedom of will. 5. Her fitneſs for permanency in a ſeparate ſtate. 6. And her capacity of receiving great improvements, both here and hereafter.

* * * * BUT though, as may appear by what has been diſcourſed, we have but an imperfect knowledge of the natures of *bodies*, yet it may be thought, that by reaſon of the cognation betwixt her and them, the rational ſoul may have a better knowledge of the nature of *ſpirits*, ſince they are rational and incorporeal beings, as well as ſhe. But alas! when we come to contemplate the pneumatical world, or ſyſtem, if I may ſo call it, we enter into a new world indeed, that much better deſerves that title, than did *America*, when it was firſt diſcovered by *Columbus*.

AND firſt, the very notion we have of ſpirits in general, is, to me, no ſmall argument how little we really and particularly know of them. For though ſuperficial conſiderers take up with the vulgar definition, that *a ſpirit is an immaterial ſubſtance*, yet that leaves us exceedingly to ſeek, if we aim at ſatisfaction in particular enquiries. For it declares rather what the thing *is not*, than what *it is*; and is as little inſtructive a definition, as it would be to ſay, that *a curve line is not a ſtrait one*, which ſure will never teach us what is an ellipſis, a parabola, an hyperbola, a circle, or a ſpiral line, *&c.* and much leſs acquaint us with the peculiar affections that *Euclid* demonſtrates of circles, and *Archimedes* and *Apollonius* deliver of conick ſections and other curves. Or to give you an example, that will, perhaps, appear yet more appoſite, ſince corporeal and incorporeal are oppoſites and contradictory; a man that knows, that a ſpirit is not a body, may as little know, by virtue of that, what an angel, a dæmon, or any other kind, or order of ſpirits is in particular, as the knowing, that a body is an unſpiritual ſubſtance, or which is all one, is not a ſpirit, teaches him to know the diſtinct or particular natures of the ſun, or a cloud, or of the ſtars, elements, minerals, plants, animals.

* * * THE terms we uſe of moving, perceiving, exciting, enlightning, determining, reſtraining, commanding, *&c.* do not ſuggeſt true notions of the things we would ſignify, being but applications of corporeal actions or qualities, to things of an incorporeal, and ſo of a quite differing nature and condition.

WHEN we aſcribe *power* to God, as that of creating, it is *toto cælo* differing from that which we aſcribe to bodies, and even from that which the human ſoul exerciſes on its own body.

THE knowledge we have of our own ſouls, is but partly by conſciouſneſs or internal ſenſation, the reſt we muſt learn as we can.

WHAT the ſoul does in the body, as when we remember, and ſpeak, and bluſh, and ſee, ſhe knows not how ſhe does it, nor ſo much as what inſtruments, or parts are employed in her work.

THE operations of ſpirits upon bodies and vehicles, and much more upon one another, we are in the dark about. * * * *

* * * * WHAT has been, in more than one place, delivered, about the excellency of the human mind, if it do not (as I wiſh it may) prevail with you to employ your ſagacity in the indagation of a ſubject ſo worthy of it, will, at leaſt, I hope, excuſe me, for having inſiſted on it, perhaps, more than was expected, in a diſcourſe that ought not, and was not intended, to be long. And on this

occaſion, I ſhall freely own, that it is not without much trouble, and ſome wonder too, that I obſerve the generality of men, and, which is more, not a few, that are of a philoſophical *genius*, and many that are piouſly diſpoſed, to have ſo little curioſity to enquire into the nature and faculties of their own ſouls; which are things that moſt of them ſupinely neglect, and others, that do, now and then, turn their eyes towards them, judge to be but dark and airy objects, that do leſs deſerve to be ſtudied, than almoſt any thing that buſies the thoughts of learned men. And yet I think, and do not ſcruple to ſay it, that this knowledge, which ſo many neglect and deſpiſe, nay, which the generality of men do, more than any other, faſtidiouſly ſlight, or ſtudiouſly ſhun, is, next the knowledge of its prototype, that which beſt deſerves our ſtudy, and which it moſt concerns us to attain.

It is not reaſonable to *expect*, that we, who have but an inadequate knowledge of the leaſt of corporeal things, ſhould have an adequate one of incorporeal ones; or to *pretend*, that we ought not to *cultivate* the knowledge of divine things, and immaterial ſubſtances, becauſe we cannot perfectly *underſtand* them; whilſt we are diligent and hopeful cultivators of the ſcience of bodies, which we are very far from perfectly comprehending.

APHORISMS *to Subject.*

We know but very little of the nature of our own minds, though, to diſcover that, we need not rove into, much leſs wander beyond the world without us; but only reflectingly take notice of what paſſes within ourſelves; nor need we anatomical knives, or geographical globes, or optical teleſcopes or microſcopes, or any other material, or elaborate inſtruments, to inveſtigate and detect what we ſeek for; the human mind being itſelf the ſubject, the object, the faculty, the organ, and the inſtrument, of the knowledge it ſhould attain.

When the Epicureans diſpute the beſt againſt the ſpirituality of the rational ſoul, (or mind of man) the more plauſible their arguments are, the leſs they prove what they would evince. For the ſubtilty and acuteneſs they employ, to conclude the ſoul to be corporeal, ſufficiently argue it not to be material; ſince it cannot be conceived, that any way of marſhalling or contexing of mere bodies, how ſmall, and how well ranged ſoever you may fancy them, is capable of producing ſuch ſubtil ratiocinations; whereby they do but eſtabliſh the preheminence they endeavour to oppoſe; and whilſt they ſtrive to degrade themſelves to the condition of beaſts, they do it by arguments that ſhew them to be of a ſuperior order of beings.

Those that deſpiſe the conſideration of ſpiritual things, and ſuch as do not ſenſibly affect our eyes, may do well to conſider, *both* of what importance the magnetical effluvia (whereof the terreſtrial globe inceſſantly emits numberleſs ſwarms) are, to keep the whole earth itſelf in a due and ſettled poſition: *and* how the winds, though inviſible, are not only of great efficacy and importance in navigation, but have a great intereſt in the temperature and changes of the atmoſphere. To which may be added, the force, that the *effluvia* of a good loadſtone have to move maſſes of iron itſelf; and the vigor, by which the animal ſpirits, or ſubtiler fluids of the body, are able *continually* to move, for many years, the heart, and, *upon occaſion*, with great violence, the limbs.

The rational ſoul is ineſtimably more noble and valuable than any thing corporeal; not only on the ſcore of its ſpiritual nature and powers of *acting*; but on the account of its immenſe capacity of *receiving*, both knowledge and felicity; when God ſhall vouchſafe them to her.

The capacity of the rational ſoul is ſo great, and its nature ſo ſublime, and ſo abſtruſe, that as it is an object, it ſurpaſſes its own comprehenſion, as it is a faculty.

The knowledge and inſpection of a man's own ſelf, eſpecially of his immaterial part or mind, may be more ſerviceable than we are uſually aware of, to natural *theology*, and even to revealed Religion. For, in the very nature of the mind, we may diſcern ſo lively a ſtamp, or impreſs of the divine author of it; that it is not to be wondered at, if the Carteſian and divers other philoſophers have thence raiſed themſelves to the notion of a Deity; and found a conviction of his exiſtence: which is ſo fruitful a principle, that it may eaſily lead us to a multitude of other important truths. Beſides, the human ſoul being immaterial, and there being no proof, but a great improbability, that it has been from all eternity; it muſt have had a beginning of exiſtence, which being incorporeal, it cannot have received from any thing that is a body; and therefore muſt have been created by ſome ſpirit. And if that ſpirit be acknowledged to be God, I have what we contend for: and if it be ſaid to be any other ſpirit, which muſt be of an inferior order, it is plain, that there is yet more reaſon to believe it poſſible for God to have produced it. And if God be granted to have had the power to create an immaterial being, and that ſo excellent an one as the mind is, why ſhould he be denied the power of producing a ſenſeleſs being; which is ſo ignoble, and ſo far inferior to a rational ſpirit as ſtupid matter is? Moreover, the conſideration of the wonderful union that is made of two beings, of ſuch diſtinct natures, as are the human ſoul and body, into one man, may convince us, that we muſt not reject a myſtery of religion, only becauſe there is nothing like it in *rerum natura*, or that we cannot conceive the *modus* of it.

SECT. II. SUBSECT. 3.

I have already (more than once) had occaſion to tell you, that the main thing that is aimed at, in the preſent diſcourſe, is to find, by a heedful inſpection into the works of God, juſt motives to admire, to praiſe, and to thank him for them. Upon this ground it will

will be very fit, that, after what has been ſaid of the human body and mind, looked upon ſeparately, as diſtinct ſubſtances; we proceed to conſider them as God has been pleaſed to unite them, into that heteroclite and ſingular creature, man.

I AM not ignorant, that the generality of men, without excepting thoſe that are addicted to letters, are wont, either totally to overlook, or to paſs by without any great reflection, the union we are ſpeaking of. But if we conſider the matter attentively, we may clearly diſcover, that this union, and the laws of it, deſerve a far greater, and indeed a very peculiar, regard.

AND for my part, I am of ſo differing a mind from thoſe who think, that this ſubject is not worthy of our attention, that the conſideration of the nature and properties of the unmatched union of the body and mind of man, has, I confeſs, ſometimes invited and inclined me to venture upon making a diſtinction, that appears not to have yet occurred to philoſophers, or divines. For inſtead of dividing the operations of God, here below, into two ſorts only, natural and ſupernatural; I think we may take in a third ſort, and divide the ſame operations into ſupernatural, natural in a ſtricter ſenſe, that is mechanical, and natural in a larger ſenſe, which I call ſupra-mechanical. For whereas all the *phænomena* of the world, as it is an aggregate, or ſyſtem of mere bodies, are performed by matter, and local motion, according to mechanical laws; the operations of the human mind, and its organical body upon one another, are not to be accounted for by mere matter, and its mechanical powers: as is partly evident, by what is in this paper delivered about it, and may farther appear to thoſe that, acknowledging the human ſoul to be an immaterial ſubſtance, heedfully conſider the various effects of the intercourſe betwixt her and it. So that theſe operations, that belong to a man as he is ſo, though in ſome ſenſe they are not ſupernatural, becauſe the order of things being once eſtabliſhed by the moſt wiſe and powerful author of them, they are produced according to the courſe of nature; yet they may be ſtiled ſupra-mechanical, becauſe they cannot be mechanically explicated or produced, nor can they be proved to flow from natural cauſes, if theſe are conſidered, as but corporeal ones. * * *

BUT, whatever be judged of the foregoing reflection, I think it may be juſtly ſaid, that the ſtrict aſſociation of the human body and mind is truly wonderful, as might appear, though we had no other proofs, by ſeveral peculiarities that relate to it: whereof ſome are antecedent to the union of thoſe two ſubſtances, others do eſſentially conſtitute it, and others again belong to it, as laws or properties of it; but becauſe, as I juſt now intimated, theſe are not the only proofs that may be proper for my deſign, I muſt deſire you to take them up as you will meet with them, among ſome others in the following part of this diſcourſe. For in man, in whom the human ſoul and body are in a ſtate of union and conjunction, we may conſider ſeveral things, which might here deſervedly make ſo many diſtinct heads of this ſub-ſection, if I had leiſure to treat of them ſeparately; ſuch as are, 1ſt, The union itſelf of the two parts of man, nakedly conſidered. 2dly, The time and manner of this union. 3dly, The power of the ſoul upon the body. 4thly, The paſſions, properly ſo called. 5thly, Other laws and *phænomena* of the union and intercourſe of the ſoul and body. 6thly, The dominion of the whole man over the creatures. And 7thly, Their re-union after death, by the reſurrection of the body, and the happy change of it; and perhaps new conditions of union or intercourſe.

BUT theſe heads are too many, and too comprehenſive to be here ſeverally inſiſted on (eſpecially in the order they are here delivered in.) Upon which ſcore, I muſt content myſelf only but to touch upon ſome of them, and that but very briefly. * * *

THE conſiderations, we have been diſcourſing of may furniſh us with an anſwer to thoſe friends of who reject ſome myſterious articles of the Chriſtian faith, becauſe we cannot explain them by any adequate examples, or parallel properties; for even among mere creatures, there may be inſtances of monadical beings, whoſe properties are not to be found any where elſe; as in quantity, the incommenſurableneſs of the ſide and diagonal of a ſquare; in figures, ſome of the affections of the circle, hyperbola, and other conick ſections; in bodies, thoſe of the ſphere; and, to come cloſer to the objection, in compounded beings, man, as he is a creature that reſults from the ſtrict and vital union of an incorporeal and intelligent mind, with a corporeal and organical body into one perſon, which has diverſe peculiarities, not to be met with in any creature of the whole viſible world.

APHORISMS *added to Sect.* 2. *Subſect.* 3.

APHORISM I.

THE virtuoſo will eaſily find himſelf diſpoſed to aſcribe the formation and conduct of an animal, eſpecially of a man, rather to a Divine Author, than to ſo blind a thing as chance, that ſhall without partiality, and with attention, conſider the great variety of organs requiſite to ſenſation and nutrition, eſpecially of ſucking children, and the difficulty of compendiouſly uniting them into one engine, capable of ſo many, and ſo various functions, and eſpecially of producing a new engine like itſelf. For which laſt power alone, it muſt be furniſhed with a whole ſet of otherwiſe unneceſſary, though not always unuſeful, organs: which muſt alſo be adapted to thoſe that ſhould correſpond with them in another ſex.

APHORISM II.

GOD may diſplay more of his wiſdom in the metaphorical motions of an intelligent ſubſtance, ſuch as the human mind; than in

the phyſical ones of a material ſubſtance; ſuch as is the corporeal world. For all that is done in matter, is performed by the help of local motion, by which the parts of it are divided and variouſly ranged; ſo that all the numberleſs *phænomena* that are exhibited in the material world, are but local motions of its parts, and the productions or reſults of ſuch motions: whereas an immaterial and intelligent ſubſtance is capable of as many differing modifications, as the world, as far as it is known to us, can produce ſenſations in it; ſince it is by theſe ſenſations, that we are brought to take notice of thoſe *phænomena*. And if it ſhould pleaſe the Divine Author of things, to furniſh a human body, whereto the ſoul is united, with a greater number of ſenſitive organs, or a greater tenderneſs of thoſe that belong naturally to it; it would be found capable of modifications, correſpondent to the impreſſions, it were then diſpoſed to receive, from bodies or actions that do not now affect it: and conſequently, this new ſenſibility would ſhew, that it is ſtill capable of more numerous modifications and perceptions, than all the *phænomena* of the univerſe, hitherto known to it, amount to.

APHORISM III.

God, by ſubjecting to the mind of man, ſome parts of the body it is united to, ſuch as ſome muſcles, and other inſtruments of voluntary motion, and by leaving it no power over many other parts of the ſame body, ſuch as the ſtomach, ſpleen, liver, kidneys, *&c.* that are ſubſervient to nutrition, ſhews, that he has freely, and arbitrarily eſtabliſhed the laws of union between the ſoul and body. And ſince the mind cannot, by bare willing, move even the inſtruments of voluntary motions, unleſs the organs be rightly diſpoſed, as in ſome palſies, the patient is unable to move either his hand, or his tongue, how much ſoever he deſires to do it, and cannot feel even the prick of a thorn, or a pin: we ought to think it the leſs ſtrange, that this union of the human ſoul and body ſhould be of ſuch a nature, that, when the neceſſary parts have loſt their vital diſpoſitions, without which, they muſt be unfit to obey the mind, there enſues a total ſeparation of the two differing ſubſtances, in which divorce conſiſts, what we call death.

APHORISM IV.

There are ſome of the motions of a human body, that ſeem to argue a peculiar regard, and, as it were, interpoſition of divine providence, in the production and regulation of them. For I conſider, that there are divers motions of a man's limbs, and ſome other parts, that do not ſeem derivable from the general laws of motion in things (merely) corporeal, but rather to deviate from them, or thwart them: as when, for inſtance, a man lifts up a heavy body to approach it to a fit diſtance from his eyes, and holds it in his hand, whilſt he reads it; in this caſe the natural tendency of his hand and arm, is, as well as that of the book and other heavy bodies, downwards; ſo that when he raiſes the book to his eyes, and ſuſtains it there, notwithſtanding its gravitation on his hand, the motion upward, and the *conatus* that keeps the body from falling, is the effect of the arbitrary power of his will, and not derivable from the merely mechanical laws of motion; and therefore, though I will not ſay, that this elevation of the hand, that lifts up the book, is ſupernatural, becauſe it is conformable to the regular powers, the Author of nature has vouchſafed to man, yet, it may be termed ſupra-mechanical, becauſe it does not follow from the laws of motion eſtabliſhed among corporeal things: to which inſtance may be added, with advantage, the motions of a painter's and thoſe of a ſcrivener's hand, and many others. Nor will it ſuffice to object, that the human will does, in theſe caſes, not produce any new motion, but only determine the motions of the ſpirits, and by their means of the locomotive organs. For to put a check, at pleaſure, to the motion of a body, that does already actually move in one line, and determine its motion to continue in another, that is perhaps differing from it, or even oppoſite to it; to do this, I ſay, without oppoſing to the moving body, ſome other body, which, by its reſiſtance and ſituation may change its former courſe, is not a mechanical operation, as may appear by all the changes of determination, that one body makes in the motion of another. And I conſider farther, that this power, given to the human mind, ſeems, though a wiſe, yet an arbitrary, as well as peculiar effect of God's regard to man; in that this power extends only to ſome particular parts of his body, which are performed by pure mechaniſm, without the concurrence, or ſo much as the knowledge of the rational mind, and ſometimes againſt its will; ſuch as are the ſyſtole and diaſtole of the heart, the circulation of the blood, the motion of the chyle and lympha, and the periſtaltick motion of the guts.

APHORISM V.

In thoſe inſtruments of muſick, upon which tunes are played by help of an internal and hidden machine, both the manifeſt, and the latent contrivance deſerve our wonder, though, for differing reaſons, ſome reaching much farther than others. So likewiſe in *Archimedes*'s ſphere, and thoſe curious watches, that ſhow, beſides the hour, the phaſes of the moon, the length of the days, the tides, *&c.* an ordinary man may juſtly, with admiration, diſcern the fitneſs and ſufficiency of ſuch a ſyſtem and frame of parts, and ſuch a conſecution of their motions, as the artiſt appears to have intended; and yet he may, no leſs, juſtly admire the aſtronomical and coſmographical ſkill, unknown to him, which enabled the artiſt to contrive, eſpecially in ſo little room, an inſtrument, regularly emulating the various

motions of thoſe vaſt bodies, the ſun, the moon, and the ſea.

But whatever may be ſaid of the engines made by man, yet of man himſelf, who is a living engine made by God, it may be juſtly ſaid, that our knowledge, as well as our ignorance may well be a mother of admiration. For as the human body is ſo exquiſitely fitted for its numerous and various functions, as to deſerve our wonder upon the ſcore of its organization; ſo the noble faculties of the human mind, and the laws of its unparalleled and wonderful union with the body, by ſurpaſſing our clear comprehenſion, are entitled to our deſerved admiration.

A little reflection on what has been hitherto diſcourſed, may ſerve to diſcover to you, that the knowledge and contemplation of the works of God, that make up the greater and leſſer world, may afford divers motives to piety, and incentives to devotion, in a perſon as much diſpoſed to it, as we have all along ſuppoſed our virtuoſo to be. But among theſe it may ſuffice, in ſo ſhort a paper as this was deſigned to be, to touch upon five or ſix, and obſerve, that the ſtudy of the creatures may juſtly produce in a *virtuoſo*, 1ſt, A profound *admiration* of the majeſty, and ſome of the attributes of God. Secondly, An external *celebration* of him, for them, by hymns and praiſes. Thirdly, A deep *humility* in the view of his immenſe greatneſs and majeſty, and the diſtance of our nature, as we are human creatures, from his. Fourthly, A moſt deſerved *gratitude* for what he has vouchſafed to make us, and to do for us. Fifthly. A ſincere love of ſo excellent, ſo beneficent, and in a word, ſo highly amiable a being. [In making ſuch liberable and manifold proviſions, both for our neceſſities, conveniencies, innocent delights, and inſtruction, as if we be not wanting to ourſelves; we may find he has ſtored up for us in his other works.] And laſtly, the ſtudy of God's creatures may produce a *truſt* to, or reliance and dependance on his goodneſs, his promiſes, and his ability to accompliſh them both here and hereafter, eſpecially by providing for us ſuch noble, ſuch various, ſuch manly, and in ſome caſes, ſuch ſupra human entertainments of our rational faculties, as may make us happy during all eternity itſelf.

But before we deſcend to the conſideration of the forementioned particular expreſſions of piety, or acts of natural religion, it may not be amiſs to obſerve, that the inſight of a *virtuoſo* into the works of nature, may enable him to contribute much [in a general way] to them all, by ſolidly laying, or ſtrongly confirming the foundation of all religion, whether natural or revealed, which is a firm belief of the exiſtence of God, and of ſome of his attributes that relate to the world, and to man. For, as the writer to the Hebrews judiciouſly obſerves, *He that* will *come to God*, that is, that would be religious, *muſt believe that he is, and that he is a rewarder of them that diligently ſeek him.* And this is a truth that ſurpaſſes all others, in regard of the influences it has upon mens lives, as much as the pole ſtar is more conſiderable than any other of the firmament, though they ſhine never ſo bright, to the attentive pilot; ſince by its direction, he ſteers all his courſes in his navigation. I know it will be ſaid by ſome, that it ſeems a libelling of our times and country, to labour to confirm the exiſtence of a Deity, as if in a Chriſtian country there could be any ſuch monſters as atheiſts or infidels. But though, by the converſation I have had for many years, with no ſmall variety of perſons, who were ſuſpected to be unfavourable enough to religion, I am not ſatisfied, that I have met two or three ſpeculative and reſolved atheiſts, yet I am forced to ſuſpect, if not to believe, that the territory of infidelity is not by much ſo narrowly circumſcribed, as moſt men take it to be. For though, thanks be to God, and (partly) to good laws, there is little profeſſed and ſpeculative atheiſm to be found amongſt us; yet in Chriſtian countries themſelves, there are too many that are but baptiſed infidels, eſpecially among the pretenders to the knowledge of nature. For theſe men are not indeed, upon a deliberate *examen* of the queſtion, come to a ſettled belief, that there is no Deity, and therefore may perchance abſtain from ſome groſs, heinous, or unprofitable ſins, *for fear there ſhould be one*: but they are not ſo fully perſuaded, that really *there is one*, as, out of regard to him, to deny themſelves a much beloved, or very profitable ſin, or undergo any conſiderable hardſhip, or run any great danger. For ſome of theſe irreſolved perſons never thought the queſtion, *whether or no there be a God*, worthy of a deliberate and ſerious debate, and therefore have no principle in them, that will carry them either to act or to ſuffer nobly for religion: and others, though they do not deſpiſe the queſtion, yet do rather *take it for granted*, that there is a Deity, than *truly believe it*. And therefore they will ſuffer it, perhaps, to influence thoſe paſſages of their lives, for which they are not much concerned: but when there happens to be a caſe, wherein, though a firm belief *would*, yet a bare ſurmiſe *will never* enable them to ſurmount a great difficulty, or reſiſt a ſtrong temptation, it will quickly appear to others, and oftentimes to themſelves too, that their ſuppoſed faith was but a deceitful preſumption.

For my part, the obſervation I have been long making of the publick and private tranſactions of men, inclines me to think, that *though* inconſideration and inordinate affections have oftentimes a criminal part in the impieties and immoralities that debaſe and trouble mankind; *yet* the greateſt part of the miſchief that bad men do to others, or themſelves, may be imputed to the want of a ſufficiently firm conviction, or belief of the exiſtence and the main attributes of God. For though in particular actions, men, whoſe perſuaſions are found, may, by the impetuoſity of a paſſion or temptation, be hurried into great and criminal tranſgreſſions; yet it is hard to conceive, that deliberate, avowed, and habitual

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impieties and vices, can conſiſt with a deliberate and firm belief, that there is ſuch a being, as even natural religion repreſents God to be: that is, not an undiſcerning, weak, or unconcerned, and in a word, a mere nominal deity; but ſuch a powerful, wiſe, juſt, and active author, upholder, and ſovereign governor of the world, as philoſophy itſelf has been able to repreſent God to be. * * * *

As in divine faith, the meaſures are very unequal, ſome mens faith being like *Abraham*'s, of the firſt magnitude, and other mens ſo little, as to be likened to a grain of muſtard-ſeed: ſo the philoſophical faith, (if I may ſo call it) or the aſſent that, upon grounds furniſhed by nature, men have concerning the exiſtence and chief attributes of God, is very unequal, as to the degrees of evidence and firmneſs. And therefore it cannot but be an employment very worthy of a Chriſtian philoſopher, to range about among the creatures, and diſcover there what arguments he can, to confirm in himſelf and others, that great and fundamental truth, which is ſuppoſed in all the truths of natural, as well as of revealed religion. And here give me leave to conſider, that though even a very weak aſſent may keep a man from being a downright atheiſt, yet it will not ordinarily ſuffice to make him a pious man; but his piety, as well as his other virtues, will uſually be proportionate to the firmneſs of the aſſent he gives to that fundamental article of religion, that there is a Divine Maker and Ruler of the world. For this may be compared to a tree, which may indeed grow without reaching much beneath the ſurface of the ground, but one that is better rooted, is not only more free from the danger of being thrown down by winds and ſtorms, but by ſpreading its roots far and deep, becomes as well more fruitful, as more robuſt and firm. And ſure, a Chriſtian *virtuoſo* may very well think it worth while to *ſtudy* the world, in order to gather from that inſpection, arguments to prove a Deity, ſince it is very probable, that the world was *made*, to manifeſt the exiſtence, and diſplay the attributes of God; who, on this ſuppoſition, may be ſaid to have made the world for the ſame purpoſe, for which the pious philoſopher ſtudies it.

Applicatory Reflections.

Admiration.

Now to apply the paſt diſcourſe to our preſent ſcope; as the contemplation of the creatures naturally leads a *virtuoſo* to admire the Divine Author for them, ſo when this admiration is rightly grounded and directed, it becomes an act of piety or natural religion. For admiration, when it regards a perſon, involves in its notion an inward acknowledgement of great excellency in the object. And accordingly, he that duly admires God for the immenſe power, the matchleſs wiſdom, and the exuberant goodneſs he has diſplayed in the fabrick and guidance of the univerſe, and mankind, does by that internal conviction of the greatneſs, or rather boundleſſneſs of thoſe perfections, pay God the nobleſt homage his human intellect is able to tender. And that high veneration, which this inſpection of the creatures produces in the innermoſt receſſes of the mind, is an act of adoration, by which the rational ſoul doth indeed (to uſe our Saviour's expreſſion on another occaſion) *worſhip God in ſpirit and in truth*; ſince in the exerciſe of this philoſophical devotion, (if I may ſo call it) the mind is exceedingly raiſed and elevated, to frame notions and thoughts of God the leaſt unworthy of him, that our preſent imperfect ſtate will permit.

Among the many corporeal *phænomena*, and the other things, that may ſerve for juſt motives to a high admiration of the divine attributes diſplayed in the creatures, the chief, or at leaſt the fitteſt to be here touched upon by me, ſeem to be the following *ſix*, viz. 1ſt, The vaſtneſs of extent of the common matter of bodies. 2dly, The ſtupendious quantity and excellent laws of motion, framed and maintained in the parts of this common matter. 3dly, The amaſing number of creatures, that by motion are produced out of this common matter. 4thly, The incomputable variety that is to be found among theſe productions. 5thly, The exquiſite ſtructures and contrivances of theſe productions, in particular. 6thly and laſtly, Their relations to each other, as by way of influence and dependency, co-ordinations of ſome ſorts, and ſubordinations of other ſorts, mutual ſubſerviency to one another, harmony and ſymmetry, in reference to the coſmical ſyſtem, and the whole that they conſtitute. * * *

There is a ſtrange mixture of willingneſs and neceſſity, in the admiration that is produced in a Chriſtian *virtuoſo*, by the conſideration of the works of God. For *though* by an attentive and ſkilful contemplation of that multitude and variety of curiouſly framed objects, that he may meet with among them, he finds himſelf reduced to acknowledge, both that they are wonderfully contrived and ordered, and that they are more ſo than he is able to explicate or comprehend; *yet* his devotion makes him forward to confeſs this internal conviction, and even to rejoice in finding, that the ſupreme object of his veneration and love, is the author of greater perfections than he is able to comprehend. * * *

I confeſs it is an eaſy thing to loſe one ſelf in ſuch ſpeculations, about God's wiſdom, and his other attributes diſplayed in the framing and conduct of his creatures. But by this happy loſs, a pious *virtuoſo* finds himſelf a gainer, not only by diſcovering more and more of the divine excellencies, the further his contemplation penetrates into the myſteries or receſſes of them; but alſo by diſcovering, that how far ſoever his ſpeculations may have carried him, yet there remains in the divine perfections, an immenſe region, that is ſtill unknown to him, and which no penetration, or induſtry will enable him to ſee any bounds of. So that at the ſame time, and by the ſame means, he enlarges his knowledge, and yet plainly diſcerns, that he can never enlarge it ſo as to make

make it any thing near adequate to its object. For by ſeeing ſo far, and by finding himſelf unable to ſee that, which he is convinced muſt lie beyond the bounds of his ſight; it is natural for him to conclude, *both* that the divine object is admirable, and that it is to his underſtanding, incomprehenſible. And indeed when we duly contemplate the divine attributes, and the ſignatures of them that are ſtamped upon (ſome, eſpecially, of) the creatures, even rapturous and exſtatick celebrations are not only allowable, but laudable: and a *virtuoſo* may employ ſuch expreſſions without being an *enthuſiaſt*, or doing ought, but what becomes a philoſopher.

If a naturaliſt were tranſported to, and made able to ſubſiſt in one of thoſe cœleſtial comets, that, according to ſome eminent modern mathematicians, are ſaid to paſs through divers *vortices*, till their continual remove from us, makes them vaniſh. Upon this ſuppoſition, I ſay, with what admiration and delight, may we preſume, that ſuch a man would paſs thorough thoſe cœleſtial regions, and ſurvey thoſe ſhining globes, that he ſhould in his way ſee near enough to diſcover, that they are not only far more vaſt, but perhaps far more adorned with multitudes of various creatures, and curious pieces of work, than the dull earth, we men inhabit. For even of this comparatively little globe, not to call it pill, in ſome American regions, that are, by great odds, leſs remote from our country, than the *Eaſt-Indies* are from *Europe*, the firſt diſcoverers inform us, that they ſcarce found any (not half a dozen) of the ſame kinds of animals, that we Europeans have among us; ſo that beaſts, birds, fiſhes, trees, fruits, herbs, and almoſt every thing they met with was new and ſurpriſing to them. And yet we know, that *America* affords us both plenty, and variety of creatures, which, though much differing from thoſe our countries ſupply us with, are no leſs noble, rich, and curiouſly framed than they.

But here I conceive myſelf obliged to admoniſh you, that a Chriſtian virtuoſo may excite and cheriſh pious ſentiments in himſelf and others, not only by his contemplations of the corporeal creatures of God, but as he is verſed in chemiſtry, hydroſtaticks, *&c.* by his ſkilful ways of managing and improving them to human uſes, ſuch as medical, metallurgical, mechanical, agriculture, manual, and other trades.

Though ſpeculative philoſophy does moſt conduce to the glory of the Creator of things, as that which diſplays his wiſdom in the formation and conduct of the world, yet I think practical, or rather operative philoſophy, which teaches men the manifold uſefulneſs of the creatures to human life and welfare, may much contribute to the ſame end, the glory of God. For when we find by welcome experience, the great advantages, that we may by the due exerciſe of the rational faculty, God has endowed us with, derive from the creatures, he has liberally beſtowed upon us, we are naturally led to acknowledge thankfully his goodneſs, and look upon him as a greater benefactor to us, than otherwiſe we ſhould think him. I ſee not why a chemiſt, for inſtance, may not find himſelf engaged to glorify God for his creatures, as well as a coſmographer; nor why an aſtronomer ſhould be more affected with the ſpeculation of the pole ſtar, as it makes a lucid part of the cœleſtial globe, than a pilot that finds himſelf enabled, with the ſight of that ſtar, to ſteer his courſe, in the darkeſt night, through the ocean itſelf, to the deſired port.

I grant then, that the ſpeculative part of natural philoſophy, does *moſt conduce* to make men admire and praiſe God's *wiſdom*; but the experimental part, may *powerfully engage* them to admire and praiſe his *goodneſs*. And as in this great and noble machine of the world, God has thought fit to diſplay more than one of his divine attributes; ſo I think, that they ought, each of them, to excite ſuitable affections in us: and that the curious fabrick of the world does highly deſerve our praiſes, but ſhould not ingroſs them: ſince as we owe our admiration to his incomparable wiſdom, ſo we owe, both that and our gratitude to his diffuſed beneficence.

There is a great deal of difference betwixt the admiration that proceeds from *ſimple ignorance*, i. e. a neſcience of what a learned man may and ought to know, and that which proceeds from a *learned ignorance*, if I may ſo call it, wherein a man, after having taken pains to be inſtructed, is, by the utmoſt knowledge he has attained, made ſenſible, that that knowledge is but imperfect, and very diſproportionate to the admired object. * * * *

* * * There is a great deal of difference between admiration, and admiration, according to the degrees of knowledge of the perſons that admire, and the grounds upon which they do it. And accordingly the wiſdom and munificence of God, expreſſed in the greater and the leſſer world, are nothing near ſo well celebrated by the vulgar of men, or even of ſcholars, as they may, and ought to be by philoſophers and *virtuoſi*. For *though* the obvious phænomena of the world, that preſent themſelves to the eyes, even of vulgar beholders, have on them ſtamps, or impreſſes of their Divine Author's attributes, capable of being ſeen, even by unſkilful or perfunctory ſpectators; *yet* the conceptions, that have but ſuch ſuperficial notices for their riſes, muſt needs fall very far ſhort of thoſe ſublime, and enlarged ideas of the works of God, that are framed by the more enlightened intellects of thoſe, that, not content with the ſuperficial proſpects of ſuch excellent pieces of work, do with great induſtry and ſagacity penetrate as far as thoſe two helps will enable them, (and that is more than a little) into the latent ſtructures, ſprings, and other contrivances, and in a word, into the more intimate nature, or conſtitution of particular things, and their ſeveral relations to the various bodies (though, perhaps, very differing and diſtant, that, according to the inſtitution of the Author of things, either act upon them, or are acted

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on by them. It is true, that ignorance of the cauſes of things, or of the manner of their being produced, is very ordinarily the parent of wonder. But this remark belongs to ſuch caſes, where it is the want of ſuch inſtruction, as learned men may give the ignorant admirer, that raiſes his wonder, which, oftentimes too, terminates in the ſenſible *phænomena*, or effect produced, as it was excited *by* it. But beſides this admiration of the ignorant, there is an admiration of the learned, which brings far greater honour to the Author of the things, that are both ways, but by differently qualified perſons, admired. For there are many of the works of God, which all the diſciplines, that a man can reſort to for inſtructions, will but engage him to admire the more deſervedly. For as I partly noted already, a true *virtuoſo* will not be ſatisfied with the obvious appearances of things, though even theſe may challenge ſome wonder, but he will be curious about the hidden manner, whereby thoſe appearances or *phænomena* are produced: and when by attentive and ſkilful ſpeculations he diſcovers, that ſo far, and no farther, he can give himſelf a rational account of the manner how ſuch difficult things are brought to paſs, his admiration becomes thereby, as well greater, as better grounded.

It is true, that here below, familiarity oftentimes breeds contempt or wearineſs. But when the mind is converſant about divine objects, the innumerous and (as to our way of apprehenſion) manifold proſpects they afford, are ſuch, both for excellency and number, that the mind can never exhauſt that fountain of rational, and perhaps exſtatical delights: but finds in that moſt glorious, and, in a ſound ſenſe, moſt various object, new cauſes of pleaſure and motives of veneration, as ſhe conſiders it under this, or that aſpect: juſt as a rich diamond, cut in facettes, appears with new and varied beauty and luſtre, as its parts and motions are conſidered in this, or that poſition and light: and though the bleſſed angels have, ever ſince the beginning of the world, been employed in contemplating, celebrating, and ſerving God; yet, far from being weary of thoſe bleſſed employments, they diſcover ſtill, in that boundleſs ocean of perfections, things fit to heighten, even *their* wonder and veneration.

Admiration and Celebration.

* * * Though I do not deny a diſtinction, between the admiration, and the celebration of God's works, ſince the former, as ſuch, is an internal affection, confined to the ſoul of the admirer, and the latter, is an external declaration of that ſentiment by words, and ſometimes alſo by actions; *yet* theſe two are, on ſeveral accounts, of ſuch great affinity to one another, that moſt of the things I have to ſay in this ſubſection, may be applied to both. And therefore I ſhall not be ſolicitous to ſort them nicely, contenting myſelf, if there be occaſion, to poſtpoſe to the reſt, ſome more properly referable to the later member of the propoſed diſtinction, than to the former. * * *

As our virtuoſo (whom in this diſcourſe we always ſuppoſe to be a naturaliſt) by his deeper inſight into the works of God, is able to diſcern far better than another ſpectator, how much they deſerve to be admired; ſo he is upon the ſame ſcore, far better qualified than other men, though, perhaps, otherwiſe learned, to celebrate the divine opificer for them. For the ſkill, that his experiments and ſpeculations may have given him, of the divine artifices and providence, obſervable in the frame and government of the world, may enable him both to diſcern, and to diſplay many excellent ſignatures and impreſſes of the divine wiſdom, œconomy, and beneficence, that a man needs be an induſtrious, and happier ſtudier of nature's wonders, to be able to perceive himſelf, and much more, to be fit to diſcloſe them to others.

A virtuoso may glorify God, *i. e.* declare his divine perfections. 1ſt, As he is a *naturaliſt in general*, ſince a ſchool-philoſopher, and even an illiterate perſon may ſee in the creatures, things that deſerve our veneration and praiſe. And 2dly, as a *virtuoſo*, or *modern naturaliſt*, who is verſed in a way of philoſophiſing, that may enable *him* to diſcern himſelf, and diſcover to others, a *great many* ſignatures and impreſſes of the divine attributes, not taken notice of, or not reflected on by the ancients, nor by merely book-learned ſpectators, even of this age, that are ſo many juſt, as well as new motives, to praiſe the moſt wiſe Author of ſuch excellent works.

Though admiration of God for his works, be a kind of mental celebration of him, and is very much our duty, yet whilſt it is but internal, it does not ſhow itſelf abroad; it may be indeed, and probably is acceptable to God, who ſees the heart: but is too private an homage. It is fit therefore, that we publickly declare our admiration to others, and invite them to join with us, in acknowledging and celebrating the excellencies, that we have diſcovered to be diſplayed in the creatures, whereby we may, as far as in us lies, both do right to the divine poſſeſſor of ſuch excellencies, and engage others, by our example and reaſon, to join with us, to glorify him for them. Since the ſcripture introduces God himſelf, as ſaying, *he that offers praiſe, glorifieth me* *. And indeed it has been, from age to age, the general ſentiment of mankind, that the moſt excellent, and beneficent being has a title, not only to our internal veneration, but to external and ſolemn expreſſions of it, both vocal and real. * Pſ. l. ult.

By vocal, I mean, not only thankſgivings, but pathetical expreſſions, whereby God's excellencies, and the impreſſes of them, in his works and doings, are magnified and extolled, which, for the greater ſolemnity, and the raiſing of mens minds to higher thoughts of him, and them, were, alſo, oftentimes accompanied with the choiceſt muſick, and ſometimes, with poetical raptures, dreſſed in a form of ſongs or hymns.

But beſides theſe, the light of nature taught men to declare their veneration and gratitude,

by ſuch expreſſions, as, for diſtinction ſake, I call real, ſuch as are erecting of altars, temples, and other ſtructures, in honour of the Deity, true or ſuppoſed, they adored, as alſo feaſts and ſuch like publick rejoicings, and particularly ſacrifices, which laſt I the rather mention, becauſe that the more religious among philoſophers offered ſacrifice to *Mercury*, *Apollo*, *Minerva*, *Æſculapius*, &c. for the diſcoveries which they made, as they ſuppoſed, by the patefactions, or guidance, and influence of thoſe divinely intelligent beings. Of this we have a memorable example in that great philoſopher *Pythagoras*, who, as ſeveral ancient writers tell us, ſacrificed a hecatomb to the muſes, for the happy diſcovery he made of that noble and uſeful theorem, that was afterwards made the propoſition of the firſt book of *Euclid*'s Elements, where it may be ſtill found, though, perhaps, all the good uſes of it will not in haſte be found out.

SINCE then even heathen philoſophers could think themſelves obliged not to confine their gratitude to the breaſt, but to make publick acknowledgments of it; it will ſurely become a Chriſtian *virtuoſo*, to whom God has vouchſafed more than ordinary degrees of knowledge, of the excellency and uſefulneſs of his admirable works of creation and providence, to extol and celebrate the Divine Author of them, and invite others to join with him, in paying a debt of praiſe and thanks, which is ſo great, that he is not able, alone, ſufficiently to acknowledge. The beſt way of doing this, is to manifeſt to others, (by more exact accounts, enriched with new diſcoveries,) and engage them to take notice of the wonderful works of God, which neither a vulgar ſpectator, or even a vulgar ſcholar, is able to do, any thing near ſo well as a ſkilful naturaliſt, and curious *virtuoſo*; for ſuch a perſon, by the help of anatomy, aſtronomy, chemiſtry, hydroſtaticks, dioptricks, &c. will be able to diſcloſe many wonderful things, about the fabrick, uſes, &c. of many of the creatures, that by unſkilful, or unattentive, or lazy peruſers, are altogether either unperceived, or unheeded. For, to inculcate here, what I elſewhere note, the works of God, need no greater celebration, than to be ſkilfully diſplayed, and well underſtood, being not like the feats of juglers, that require ignorant, or heedleſs ſpectators to make themſelves admired, nor like the engines, and other works made by human artificers, which loſe their admirableneſs, when the artifice comes to be diſcovered, but the works of God are ſo perfect in their kind, that the more narrowly and critically they are inſpected, the more curious and exquiſite they appear, and the more they recommend the wiſdom and munificence of the Divine Author, and the more they invite the critical inſpectors to magnify him, for them. * * * *

THE knowledge that a virtuoſo has, above that of the vulgar, or the mere ſchool-men, of the admirable fabrick of his own body, or the faculties of his mind, and of the ſenſations and paſſions that ariſe from their conjunction, deſerves, that he ſhould, for ſuch excellent things, extol and magnify the divine wiſdom and goodneſs. For ſure, if it be his duty to praiſe God for inanimate beings, and animals devoid of reaſon, he has much more cauſe to celebrate the divine goodneſs, for the fabrick of his body, which, for ought we know, is the curiouſeſt piece of workmanſhip, of all corporeal creatures, in the world, and yet more reaſon to extol the Author of his nature, for having ennobled him with a mind capable of the knowledge of ſuch a body, and of celebrating the Author of the fabrick of that, and the much more noble nature, ſhe herſelf is bleſſed with.

A TRUE Chriſtian philoſopher thinks it a greater honour and advantage to be the image of God, than his vicegerent, and to have ſome, though but a faint *reſemblance* of his knowledge, immortality, holineſs, and ſome other perfections, than a *participation* of his power, over inferior creatures. And ſuch a perſon will find a higher ſatisfaction in being, as it were, the *prieſt of nature*, that offers up, what he only, of the viſible creatures, can preſent, the ſacrifice of praiſe and wonder to their common Maker, than in being *prince of the inferior world*; juſtly reputing piety to be a greater bleſſing than empire.

THE viſible works of God appear ſo excellent, even to ſuch immaterial and intelligent creatures as inhabit the inviſible world, that the ſcripture repreſents the angels themſelves, as applauding and celebrating their Maker, upon his *laying the foundations of the earth*, and the glorified ſaints, in the *apocalyps*, are introduced, as adoring and praiſing God, for his admirable works of the creation.

Humility. IT will, probably, be thought ſomewhat ſtrange, that among the religious virtues, which the contemplation of God's creatures, is proper to excite, or cheriſh in our virtuoſo, I ſhould reckon humility, ſince the higher degree of knowledge, that his inſpection into God's works, is reaſonably ſuppoſed to have given him, ſeems more likely to puff him up, than to make him humble.

BUT, to counterbalance this temptation, there are divers things in the book of nature, that are very fit to give a well-diſpoſed mind, ſentiments of humility, ſome of which reflections, I ſhall now briefly mention: though I purpoſely decline to inſiſt on the reproach, that ſeems to be made, even to the beſt part of mankind, the people of God, by the reſt of the creatures, whoſe regular conformity to the laws, God has ſettled for them in nature, may upbraid the moral irregularity of men, who alone, of the viſible creatures, are endowed with reaſon, that enables them to know God's laws, and a will, whereby they may conform to many, that they deviate from.

To proceed then, to motives of another kind, I ſhall in the firſt place repreſent, that it is an aſtoniſhing thing, to a perſon acquainted with modern diſcoveries, to conſider, attentively, the wonderful vaſtneſs of the corporeal world. For *not only* mankind, if

it were all crowded into one place, would be of very inconſiderable bulk, in reſpect of the globe, it inhabits; *but* this terreſtrial globe itſelf, is, without hyperbole, but a phyſical point, in compariſon of the cœleſtial part of the univerſe. Nay, as is elſewhere declared, according to the Copernicans, and divers others of the more accurate, modern aſtronomers, the ſame may be ſaid of the incomparably vaſter great orb itſelf, which is that wherein the earth moves about the ſun, or he about her. Now it is natural enough, that the contemplation of this almoſt inconceivable extent of the world, ſhould make man, who is but an atom, in compariſon of that globe he inhabits, which is itſelf ſcarce more than an atom, in compariſon of the viſible world; ſhould, I ſay, make man have humble thoughts of ſuch a body as his, when he compares himſelf to that *great God*, as the ſcripture ſpeaks, that made and governs this immenſe maſs, we call the world, and whoſe power doth infinitely exceed it. The evangelical prophet, in a lofty ſtrain, magnifies God, for the great inferiority of mankind to him: Iſaiah xl. 15. *Behold*, ſaith he, *the nations are as a drop of the bucket*, &c. and *are counted as the ſmall duſt of the balance; behold, he taketh up the iſles, as a very little thing*: and again a little after, * v. 17. * *All nations, before him, are as nothing, and they are counted to him, leſs than nothing, and vanity.*

A REFLECTION of this kind, ſuggeſted to the kingly prophet, that humble and adoring exclamation, Pſal. viii. 3. *When I conſider thy heavens, the work of thy fingers, the moon and ſtars*, (for it ſeems this devout addreſs was made in the night) *which thou haſt ordained, what is man that thou art mindful of him, and the ſon of man that thou viſiteſt him!* * * * *

THERE is another reflection, that may juſtly lead our *virtuoſo* to ſentiments of humility, which is, the imperfection of his knowledge of God's creatures, both in regard of thoſe, that he is a ſtranger to, and in relation to thoſe, which men are preſumed to be already acquainted with. * * * *

IT is true, that the opinion, men generally have, that becauſe *virtuoſi*, are more induſtrious to pry into the ſecrets of nature, than other men, they are liable to a greater temptation than they, to be proud of their knowledge, is a perſuaſion ſpecious enough: but yet, I think it erroneous, as grounded upon a miſtake. For the ſame application of mind, and the ſame inſtruments of knowledge, that enable them to make uncommon diſcoveries, are fit, at the ſame time, to make them ſenſible, that there remains more and more to be diſcovered, in the objects of their knowledge, and let them ſee, that *as* they have learned divers things, that vulgar ſcholars do not know, *ſo* they muſt confeſs, that there are more things, neceſſary to be learned, for the compleat knowledge of their ſubjects, than vulgar philoſophers do ſo much as dream they ought to know, and than theſe virtuoſi themſelves have yet attained the knowledge of.

Gratitude. OUR gratitude, when it reſpects God himſelf, who has obliged us in ſuch peculiar ways, and ſuch high degrees, as no other benefactor can do, ſhould engage us, not only, to acknowledge *thankfully*, his great beneficence, but to make that a powerful motive, to *love* the divine Donor of all theſe benefits. This reflection, together with the great affinity between gratitude to God, and love of him, which makes it very difficult, and not very neceſſary, to ſeparate thoſe two duties, if not parts of the ſame duty, are the reaſons why, when I diſcourſe of the former, in this fourth article, I ſhall treat in ſuch a manner of gratitude, more ſtrictly ſo called, to God, as not to ſeparate from the reſt, divers paſſages, that relate more directly to the fifth article, about the love of God, as being fit to become incentives to it.

THE Gentiles, by the light of nature, had the means of obtaining ſo much knowledge of God, that is, of what was expedient for them to know, and not too difficult to attain, as to render them excuſeleſs, if they did not pay him a high veneration and gratitude. For they are condemned, by their apoſtle, for two things, which, by his cenſuring them for, it appears, that the light of natural reaſon ought to have led them to avoid. For *firſt*, he reproaches them for this, that, *having known God*, they yet *did not glorify him as God*, i. e. with that peculiar and higheſt veneration, that belongs to the ſupreme and moſt excellent of beings. And *then*, he reproves them for not being thankful to him, in ſuch a manner and degree, as becomes, and as far as may be, is worthy of a divine and moſt munificent benefactor. Both which reprehenſions laid together, ſufficiently argue, that if the works of God's creation and providence, be duly conſidered, though but by the dim remains of the light of nature, much impaired indeed, but not extinguiſhed by the fall of our firſt parents, it will ſuggeſt both ſufficient proofs of the exiſtence, power, eternity, and divers other attributes of God, and furniſh the mind with very engaging motives to gratitude, to ſo excellent and beneficent a being: the genuine expreſſions of which gratitude, are not only verbal, ſuch as are praiſes and thanks, but real too, ſuch as to pay him religious worſhip, imitation of him in all things, wherein it is fit for us to endeavour it, and a faithful obedience to all his laws, written in our hearts, or that by any other means, come to our knowledge. * * *

BESIDES the benefit a man receives from his continual conſervation, by God's ſuſtaining power, as he is a part of the univerſe, and ſo partakes of the common benefit of the creatures in general, there is ſcarce any man, eſpecially, if he be not young, that does not owe very much to his Maker, for particular and perſonal preſervations, there are very few that take notice of this, and make returns of gratitude, any way proportionate, to what the benefit deſerves. For, when I conſider what a vaſt number and variety of accidents, man is ſubject to in this world, and how often he is in

danger, even when he knows it not, or has the leaſt ſuſpicion of it, and ſo does nothing to prevent ſome, and can do nothing, to the purpoſe, to prevent others, did he know them, never ſo well, I can ſcarce but admire to ſee an old man, eſpecially that enjoys health. For a human body conſiſts of divers hundreds of parts, great and diſtinct enough, to be manifeſt to the unaſſiſted eye, nay, and to have diſtinct names given them, by anatomiſts, and each of theſe may be harmed, by ſo many outward agents, and internal cauſes, and ſome of theſe inviſible and unſuſpected, that, as I elſewhere note, it ſeems as ſtrange, that in ſo compounded and delicate a machine, as a human body, nothing ſhould be out of order, or complained of, as that a muſical inſtrument, that were furniſhed with a thouſand ſtrings, (none of them ſuperfluous,) ſhould be long in tune, ſince the very change of the air, may ſuffice to diſorder it, as oftentimes we ſee it alſo do, to the living machine of a human body.

VENOMOUS creatures themſelves are not to be kept out of the liſt (or number) of thoſe, for which men ought to praiſe and thank the Creator. For however, in ſome regards, or in ſome circumſtances, they may be hurtful to us, yet, their nature may be as admirable, as thoſe that are harmleſs, or even beneficial to us. And therefore deſerves, that we ſhould praiſe the Author of ſuch curious works, as we do the fires of a pyroboliſt, and the artificer himſelf, as well, when they threaten us in bombs and fire-balls, as when they ſhine innocently, in rockets, and other delightful fireworks; and as for the miſchievouſneſs of ſome venomous creatures, it is, in many inſtances, compenſated by the advantageous uſes, that ſkilful men have already made, or, in probability, will hereafter make of them, as did partly appear, long ago, by viper-wine, treacle, *&c.* and by oil of ſcorpions, uſeful for divers diſtempers, beſides thoſe, which their own ſtings produce. Thus, though opium be vulgarly reckoned among poiſons, and indeed too often proves one, in unſkilful hands, yet, eſpecially if it be dexterouſly prepared, when it is given in a fit doſe, and other circumſtances, it becomes a remedy, that many of the modern phyſicians look upon, as one of the chief and nobleſt inſtruments of phyſick. And ſo arſenick, though a rank poiſon, may be ſo corrected, that ſome chemiſts have made very good uſe of it, in ſtubborn outward affections. And by an eaſy preparation of it, not to be met with in any book, we have ſo corrected it, that not only it proved, in chirurgeons hands, very effectual in ſome uncommon and obſtinate diſtempers, but, almoſt againſt my will, was given in pretty large doſes inwardly, and found to be a notable medicine, operating as a potent diaphoretick, and, which I leſs looked for, a cordial.

GOD hath an indiſputable title to our gratitude, as being our benefactor, and that, in ſo eminent and peculiar a manner, as is impoſſible to be equalled by any other. For beſides, that upon the ſcore of being our maker and preſerver, we owe him even ourſelves, we are likewiſe indebted to him, for all the benefits, that we receive from other benefactors. For as, ſpeaking in general, he alone is the original and exuberant fountain of good: ſo, as to particular men, he is, what an apoſtle ſtiles him, that *Father of lights, from whom every good and perfect gift comes down unto us* *, Since it is he that gives all our other benefactors, as well the ability, as the will to be ſo, and that doth indeed intend us all, that is reached out to us, by the hands of others, who, though they are looked upon as free agents, are indeed but as inſtruments, in doing of us good. And therefore, if the nobleſt patriots, among the ancient Gentiles, had reaſon to eſteem, that the gratitude, that a man owes his parents and his country, can never be fully diſcharged, or ſo paid off, as not to remain due; ſure ſuch an obligation on us, may be far more challenged by God, to whom we owe them, our parents, and our country, as well as other bleſſings.

* James i. 17.

NOR do the benefits we enjoy as men, exact ſo much of our gratitude, as the advantages which he doth vouchſafe us, as Chriſtians. For, as he gives us, in reaſon, a capacity of *knowing* him, ſo he allows us, in religion, the means of *enjoying him*: and not only permits, but invites and encourages us to aſpire to a felicity, that will ſo dignify our natures, and make our perſons ſo happy, that all that we either do, or can enjoy here below, is the leaſt part of thoſe bleſſings, which nothing, but our being unkindly and criminally wanting to ourſelves, can make us miſs. So that we owe him incomparably leſs, for what we poſſeſs, than for what we are allowed to hope for, and the higheſt bleſſings, we can here attain to, muſt be ſo leſs, as they are preſent effects of his bounty, than, as we may make them pledges of his future favour.

IT ought much to encreaſe our gratitude to God, for all the above mentioned benefits, and indeed, all his benefits in general, that they are wholly free, and no way deſerved, or procured by any thing in us. For we owe to God, our very beings, as we are men, (ſince of the ſame lump of earthy matter, of which he formed the body of the firſt man, he might, if he had pleaſed, as eaſily have formed a dog, or an ape.) This being is antecedent to, and muſt be preſuppoſed, in all thoſe qualities and actions, by which the proudeſt men can pretend any thing of merit. God was ſupremely happy in himſelf, before he made man, and that production of ſome of his other attributes, was an effect of his pure liberality, and a voluntary emanation of his exuberant goodneſs. He needs not the ſervices of men, nor receives any other advantages by them, than that they give him occaſions to exerciſe his liberality, to thoſe that perform them, nor needs he the unſkilful praiſes of mortal men. Since, if he delighted in them, for their own ſakes, he can be, and ſtill is celebrated, by the hymns and hallelujahs of creatures, of a higher order than men, I mean the angels, who with joyful ſongs and

ſhouts

ſhouts did, as we are told, in the book of *Job*, celebrate the foundation of the earth, and afterwards loudly praiſed God, for the whole creation, as we are told, in the apocalyps. * * * * * God is ſo munificent and diſintereſted a benefactor, that gratitude to him is not more a great duty, than a profitable one. For when we pay him our thanks, we invite him to encreaſe the motives of our thankfulneſs.

For his goodneſs delights in the occaſions of exerciſing further degrees of it, when he finds, that his firſt favours qualify men to receive new ones, nay, which is more, his exuberant goodneſs does not only recompenſe us with an extreme delight, when we exerciſe acts of gratitude, but rewards even, our deſires and our ineffective endeavours, to ſhow ourſelves grateful.

I will not here make a ſolemn invective againſt ingratitude, contenting myſelf to give you this obſervation about it, that, although I have for many years been reduced to converſe with no ſmall number of perſons, guilty of impiety or immorality; and though many of them owned, and gloried in their vices, ſome in this, as drunkenneſs, and ſome in another, as uncleanneſs, yet, I never met with, nor heard of any, that owned, much leſs boaſted of ingratitude: ſo heinous is that ſin, even in the eyes of thoſe, to whom other vices appear juſtifiable, if not laudable. How great a crime then muſt it be, to be ingrateful to God, who is, on many and peculiar accounts, the firſt and greateſt of our benefactors! And to apply this to our preſent purpoſe: it is ſome degree of ingratitude for benefits, that we can never be ſufficiently thankful for, if we neglect any fit means (ſuch as are a pious ſtudy of his works, with a deſign of growing more religious by it) to heighten our gratitude, and excite us to expreſs it, by thanks and praiſes, as well ſkilfully, as devoutly paid; eſpecially, ſince our acts of gratitude are, by the exuberance of our great benefactor's goodneſs, made to be ſuch, that inſtead of paying our debt, they encreaſe it; ſince by his bounty, the thanks, that we give for paſt benefits, entitle us to new ones.

Love. Those divine perfections, that have been lately repreſented, as proper motives to the ſix *ſeparate* acts of religion, formerly mentioned, thoſe, I ſay, being conſidered *all together*, and in conjunction with ſome others, ought powerfully to engage us, by their concourſe, to a true and ardent *love* of God. For the two main things, that, naturally and uſually produce love in us, are the excellency and amiableneſs of the perſon, and his kindneſs and beneficence to us. Now, both theſe attractives are to be found, and that in a peculiar way, and tranſcendent degree, united in God; who ſince (as partly has been, and partly will be ſhown,) he highly deſerves our wonder, adoration, thanks, and truſt, muſt, upon thoſe accounts, (which yet are not the ſole ones) moſt juſtly deſerve our love. For in what object can we find, *any thing near*, ſo manifold, or ſo great excellency, as in him, whoſe very nature it is to be *a being infinitely perfect*; and in whom, all thoſe excellencies, that we admire and venerate in the creatures, among whom they are but ſcattered, do meet and concur (if that be poſſible) in a more than ſuperlative degree.

Though the nature of this little tract obliges me to treat of the ſubjects handled in it, more as a naturaliſt, than a divine; yet, upon this occaſion, I ſhall deſire you to take notice, once for all, that philoſophical arguments are the moſt uſual, without being the only ones, that are employed in this paper, eſpecially, becauſe I did not think myſelf obliged, ſcrupulouſly, to forbear to uſe, now and then, a paſſage of the holy ſcriptures, when I find it very pertinent to the ſubject and deſign. For there are ſeveral things that may be proved, or perſuaded, by arguments and motives furniſhed, both by natural reaſon, and by revelation too. Of which many inſtances may be given, as in the divine attributes, the creation, the rational ſoul, the affections and paſſions incident to man, *&c.* And therefore, ſince I write not to an infidel, but to a *Chriſtian Virtuoſo*, it may be allowable, as well as uſeful, ſometimes, to bring in a paſſage or two of ſcripture, to dilucidate or confirm ſomething, whereof natural reaſon gives us *ſome*, and yet, but a more *imperfect* notice, and by the aſſociation, to enlarge our notions, and ſtrengthen what we ſay, and make it more operative.

To diſcourſe of the love of God, merely as a naturaliſt, is to treat of it with great diſadvantage and imperfection. For of the motives fit to produce that love in us, thoſe are far more powerful, that may be drawn from the reading of that divine book we call the ſcripture, than thoſe, that are afforded us by the moſt accurate inſpection of the book of nature. For this latter does, indeed, ſhow us *a part* of what God *has done for us*; but the former manifeſts to us, not only, *another part*, conſiſting of many other, and greater things, that God, and his only Son have *done for us*; but (what the contemplation of the creatures, would never have ſuggeſted, ſo much as a ſuſpicion of) thoſe afflictions, ignominies, and torments, (worſe than the death, they ended in) that his divine Son, by whom he made the world, whereto he granted him, *has ſuffered for us*. * * * *

But, though the Chriſtian religion does furniſh us with the nobleſt motives to the love of God, yet, I do not ſee cauſe to queſtion, as ſome moderns are ſaid to do, whether, by the dictates of natural reaſon, men are bound to love God. For it ſeems to me, that the obligation men have to love God, is the ſame, on which all the other duties of natural religion are founded; namely, on the *one ſide*, the excellency of his divine nature, and his beneficence to us, as the author and preſerver of human nature; and, on the *other ſide*, man's being a rational creature, who, upon the account of his reaſon, is able to diſcern enough of the divine perfections, to convince him, that they are adorable, and that he is a debtor

to

to God's goodneſs and providence, both for his being, and his well being. For, theſe relations being thus ſtated, the obligation, not only to *worſhip* and *obey*, but to *love* ſo excellent a being, and ſo bounteous a benefactor, does naturally reſult from them. * * * *

THAT it is God's will, that men ſhould love him, may be argued from hence, that he has given to man, both ideas of what is amiable, or lovely, and a propenſity, or inclination to love that, and nothing elſe. For he who is both a moſt free, and a moſt wiſe agent, would never have ſo framed the mind of man, as we find he has done, if he did not know himſelf to be moſt lovely and amiable, to ſuch a creature, rightly conſtituted; to whom, he *could* elſe have, and no doubt *would* have given other ideas and natural propenſions. * * * * *

YOU will eaſily be perſuaded of the raviſhing amiableneſs of GOD, if you conſider, that being both infinitely perfect, wiſe, and potent, it is yet his will to be beloved by men; and that he vouchſafes to appear very deſirous we ſhould accompliſh it, ſince he, that in a tranſcendent degree poſſeſſes thoſe amiable and attractive excellencies, would never have given us thoſe notions of goodneſs, and lovelineſs, that he hath done, if he did not know that his attributes can fully anſwer, and deſerve them. * * * *

BUT it will much the better appear, that men are obliged, by the dictates of natural reaſon, to love God, if we ſomewhat diſtinctly, though but briefly, conſider the immediate and proper motives to do ſo, wherewith, on ſeveral accounts, an ingenuous and rational man is furniſhed.

THESE motives, or inducements, are chiefly of two ſorts; to the firſt belong all the adorable excellencies of the divine nature, that are diſcoverable by the light of reaſon.

THE motives of the ſecond ſort, may be reduced to theſe two, which are afforded by conſidering, 1ſt, What God *has done for man.* And 2dly, What *he will do for him*, in caſe he prove a fit object of his beneficence.

To the firſt ſort belong, (as was newly ſaid) all the adorable excellencies of the divine nature, at leaſt, as far forth, as they are either clearly diſcoverable by our human reaſon, in its full exerciſe, or are, in a more particular way, probably, deducible from the conſideration of God's works of creation and providence.

THE nature of man is ſo framed, that when he perceives, in another rational being, any true virtue, or excellency, he finds himſelf incited to make that being an object of his love, though, perhaps, he did not derive, or promiſe himſelf, any perſonal benefit from the object that engages his affection. It is congruous to this, that we obſerve, that when a reader of the hiſtory of *Scipio*, *Cato*, *Socrates*, *Xenophon*, or ſome other ancient worthies, mentally tranſports himſelf, (if I may ſo ſpeak) into the country, and the age, wherein that rare perſon lived and acted; he does naturally, and oftentimes warmly, concern himſelf in the adventures of his admired hero: he heartily wiſhes him ſucceſs in his enterpriſes, is troubled at his croſſes, fears in his dangers, triumphs in his victories, rejoices in his proſperity, and, in ſhort, makes himſelf a ſharer in his good, and in his evil fortunes; which are the natural tokens of the real affection we have, for thoſe we truly love; though the heroes, whoſe partners we thus make ourſelves, lived in times and places, ſo remote, that we could receive no benefit from their greateſt proſperity, and could be no perſonal objects of their love. And it ſeems to be upon the like account, that many, eſpecially of the more generous minds, are ſo affected in reading of well writ romances, whilſt they forget, that they are but fictitious perſons, who are repreſented, as endowed with the excellent qualities, by which it was deſigned to recommend them. Upon this propenſion in human nature, to love rational beings, that excel in virtues, whether intellectual or moral, it is but juſt, that a *virtuoſo* ſhould elevate his love to God, who has not only, in a ſupreme degree, thoſe excellencies, that are directly beneficial to us, as wiſdom and beneficence, but divers others too, that make him moſt juſtly adorable; ſuch as are his ſelf-exiſtence, his abſolute independency, his ſpirituality, his eternity, both *à parte ante*, and *à parte poſt*; his immenſe power, his providence, in the conſervation and the government of his creatures, his infinite perſpicacity, and his exact veracity, *&c.* But, though I do not, nay, though I could not name any more of his perfections, in particular, yet it is rational to think, in general, that he may have many perfections, whereof we have, as yet no diſtinct notice, not to ſay, ſo much as a ſuſpicion. For when I conſider, that this viſible world of ours, though its vaſtneſs do uſually and juſtly aſtoniſh us purblind men, yet may, for ought we know, be but a ſmall part of the great univerſe, or ſyſtem of the corporeal works of God: and when I alſo conſider, that we know very little of any other of the divine perfections, ſave thoſe that relate to the creatures (among which we men are to be numbered) already known to us, *as* God's power, and his wiſdom relate to the creation and government of the world, and of mankind, *and* his goodneſs relates to his beneficence, from which effects, the ſuitable attributes of God are inferred: *ſo*, if there be *other parts*, of the material world, not yet viſible, or known to us, I ſee no reaſon, why God may not have other relations to *them*, than thoſe that our world ſuggeſts us the notices of.

I KNOW not but that I may, without impertinency, add, that we ought not confidently to think, that the corporeal world, even in its utmoſt extent, (whether viſible to our naked eyes, or not viſible to them) and alſo, even when aſſiſted by our beſt teleſcopes, affords us all the grounds we may have of thinking, that God may have many excellencies that are not known to us. For if there be really, beſides mere bodies, incorporeal beings endowed

dowed with underſtandings, and wills, we may rationally ſuppoſe, upon their account, other excellencies in God, than thoſe which his material works have diſcovered to us.

SINCE divers philoſophers, that took nature only for their guide, arrived ſo far, as to acknowledge abſtracted intelligences: *ſince* we find, that *Ariſtotle*, and the philoſophers of his numerous ſect, held ſuch to be the movers of the cœleſtial orbs: and *ſince* other philoſophers, upon differing accounts, believed there were good and bad *dæmons* of ſeveral orders, and the greater number of philoſophers believed rational ſouls to be immortal, and many of them, that, as they were diſtinguiſhed from their vehicles, were immaterial too.

SINCE theſe things, I ſay, are ſo, we may reaſonably ſuppoſe, that among thoſe communities of ſpiritual beings, many things would be found, if we were able to obſerve them, that may give God occaſion to make ſeveral exertions, (if I may ſo ſpeak) of his boundleſs and exuberant perfection, which, after our manner of conceiving things, would require diſtinct names, and induce us to frame for them other ideas, and conſider in God ſo many (new) attributes, and excellencies, that we never thought of before. As upon ſuch diſcoveries, occaſioned by the fall of the firſt man, his poſterity came to aſcribe to God new relations to his human creatures, and divers others too: upon which relations, his actings gave men occaſion, to aſcribe to him ſuch attributes as punitive juſtice, mercy, longanimity, ſeverity, patience, *&c.* proportionably to this, if we knew how his perfection is exerciſed towards thoſe ſeveral orders, or communities, of his inviſible, and yet rational creatures, that we were newly ſpeaking of, according to their ſeveral natures, laws, and actings; it is ſcarce to be doubted, but that we ſhould thence take occaſions (and that juſtly too) to frame *ideas*, for ſeveral divine excellencies, in that boundleſs ocean of perfection, God, for which we have yet no names, and much leſs any proper and diſtinct notions. * * *

I KNOW not, why it may not be added, on this occaſion, that ſince men naturally think themſelves obliged to love their benefactors, eſpecially if they be worthy perſons, and ſo are wont to look upon love, as a part, or duty of gratitude, I ſee not, I ſay, why the things repreſented, in the article about gratitude, may not be made uſe of to encreaſe the number, or, at leaſt, the force of thoſe arguments, that are, in this article, employed, to engage men to the love of God.

To the ſecond ſort of motives to love God, belong,

FIRST, The conſideration of what God has done for man, under which may be included, 1ſt, What he has made man. 2dly, The dominion he has given him over multitudes of other creatures. 3dly, His placing man in a world ſo framed, as this of ours is, and enabling him to employ, or enjoy, by contemplation, application, ſpiritualiſation, or otherwiſe, thoſe creatures he cannot reach, nor directly command. 4thly, The faculties, that are granted him, and improvable by him, over animals, plants, and foſſils, to rule over them, and convert them to his uſes. 5thly, The conſervation, both of the univerſe itſelf, or preſent frame of things, and of other animals, beſides men, by God's continual concourſe, alſo his governing the world by an admirable providence, eſpecially with relation to the welfare of mankind. 6thly, The perſonal benefits, particular men have received, and eſpecially that laſting one (not only of conſervation, but) of preſervation, by preventing dangers, and delivering them from them. * * *

AMONG the things, that God has been pleaſed to do for man, we way reckon, in the firſt place, that he has made him man, for as this is the prime benefit, and is neceſſarily preſuppoſed in all others, (for that which is not is uncapable of enjoying any thing) ſo what we have newly diſcourſed of the excellency of the human nature, may let us ſee, that we owe our Maker exceeding much, for having conferred on us ſo precious a benefit.

IN man, as it concerns our preſent purpoſe to conſider him, there are three things, that are briefly to be taken notice of, his mind, or rational ſoul, his body, and the union of both, with the natural conſequences of it. I do not here, where I am confined to a few pages, pretend to deliver a pſychology, or full and methodical diſcourſe of the ſoul, ſince it may, here, ſuffice to obſerve, that according to what has been ſaid, when we treated of it in the ſecond ſection, it is a creature endowed with moſt noble faculties, as underſtanding, will, memory, and a ſpiritual ſort of affections, and that theſe are accompanied with a capacity of being further and further improved, both by thoſe great illuminations, that God may vouchſafe it, and by his bleſſing, upon her own orderly and diligent endeavours, to improve herſelf. So that the rational ſoul being an immaterial and immortal, as well as an intelligent creature, is of a higher order, and greater excellency, than any part of the corporeal world, not to ſay, than that whole world itſelf, the ſoul being indeed but an impriſoned angel, if I may ſo call it, as in the Carteſian philoſophy, a planet is, inwardly, a ſelf ſhining ſtar, ſhrouded and kept obſcure by the groſs, and opacous matter that ſurrounds it. And this, I preſume, may ſuffice to make ſuch a gift, as the ſoul, a juſt motive to human gratitude.

BUT ſince the rational ſoul exiſts not here below, but in a vehicle, *viz.* the human body, it may juſtly encreaſe the motives of gratitude, if it be conſidered, how excellent a manſion the wiſdom, and goodneſs of God, have provided for the noble gueſt; this manſion, as *Moſes* informs us, was formed at the cloſe of the corporeal world, as a maſterpiece, worthy to crown the whole work. Of the excellency of this admirable vital engine: many things have been ſaid already, which allows me to paſs on. * * * *

I THINK

I THINK it may be deſervedly added, to the other motives, that philoſophy itſelf, affords the ſtudiers of nature, to love the God of nature; that he has made man, and man only, among his viſible creatures, capable of loving him. For whether, or no, it be true, which we are told by the Carteſians, and ſome other philoſophers, that beaſts are but engines; yet it is generally confeſſed, that no creature, that is merely corporeal, whatever love it may be capable of, for other objects, is capable of raiſing its love ſo high, as to fix upon God. Inanimate creatures are evidently uncapable of love, which is a paſſion of the ſoul, or mind, that is, of a ſubject, whereof they are deſtitute. And, for ought I know, it may well be doubted, whether brutes have any true paſſions, that is, as properly ſo called, as thoſe that go under the ſame name in men, even when the viſible motions of their bodies ſeem to argue a ſufficient reſemblance betwixt them, as a child, or perhaps a country-fellow, will judge by the grinning change made in the countenance of an ape or monkey, and much more by the noiſe, by a parrot, that has been taught to ſpeak, *&c.* that he truly laughs, though laughter have long been, by philoſophers, reckoned to be almoſt as eſſential a property of man, as rationality itſelf. And even in our own *ſpecies*, I have ſeen ſome ladies, that in violent fits of the mother, would fall into great fits of laughter, though I knew the occaſion of the hyſterical diſtempers, that produced this ſeeming laughter, was an exceſs of grief for the untimely death of a beloved relative. * * *

* * * * THE ſecond boon of the divine bounty to man is, that God has placed him in a world ſo framed as ours is, *&c.* I will not ſay, as many do, that all this vaſt and beautiful ſtructure, we call the univerſe, was made ſolely, or principally for man, but this may be ſaid, that a great part of that mundan globe, he lives upon, is very well fitted for his uſes, ſo that, if he be not wanting to himſelf, it will furniſh him, not only with all neceſſaries to his life, but with a multitude of accommodations to make it eaſy and comfortable to him. * * * *

SINCE all the beautiful and uſeful creatures we admire, or enjoy, are the free emanations of the Creator's exuberant goodneſs, it is but juſt and natural, that thoſe ſtreams ſhould lead us to the fountain, whence they flow, and give us affections ſuitable to the contentment, and other benefits we receive from them.

APHORISMS *added to Sect.* 2. *Subſect.* 4.

APHORISM I.

IF a man light upon an anonymous, but excellent poem, that is partly written in plain characters, and partly in cyphers of differing kinds, (as of numbers and tranſpoſed letters of the alphabet) it will be much more rational for him to infer, from the verſes he does clearly underſtand, that it was written by an excellent poet, than it were to argue, that becauſe he cannot underſtand ſome paſſages, that are written in cyphers, the author did not ſhow himſelf a poet, but rather wrote nonſenſe in thoſe paſſages; eſpecially, if the peruſer, having, by an attentive ſtudy, decyphered ſome part of the critical words, perceives them to be very congruous and appoſite. For thence he may very probably gather, that even thoſe paſſages are ſo too, that by reaſon of the tranſpoſitions, purpoſely made of the letters, do not afford good rhymes, but perchance ſounds very harſh and unlike to them. It is eaſy to apply this to the artifice, that ſhining in very many of the works of nature, do far more ſtrongly argue, that the world was made by an intelligent and deſigning agent, than the contrary can be proved, by ſome *phænomena*, that we cannot underſtand the reaſon of, or by few others, that, to our dim apprehenſions, appear incongruous to the providence, or wiſdom, of the author and rector of the world.

APHORISM II.

I HAVE one conſideration to add to all that I have ſaid, of the wiſdom (and, if I may ſo ſpeak) the ſkill of the divine opificer of things, which though, perhaps, it may ſomewhat ſurprize you, I cannot allow myſelf to pretermit, I conſider then, that though what I have hitherto delivered, about the wiſdom of God, and what has been obſerved, in former ages, to the ſame purpoſe, are grounded upon our ſurvey of the manifeſtly viſible world, that is, of thoſe parts of the corporeal univerſe, that are diſcoverable by our naked eyes; yet that gives us but a very imperfect notice of the works of the omniſcient author. For, I think we may diſtinguiſh the works of God into three worlds, or grand communities. The firſt, is the ſpiritual world, conſiſting of good angels, and other intelligent beings, as devils, and ſeparate human minds, that have either no bodies, or none that we can ſee. And of theſe ſpirits, there may be more ſpecies, than we are acquainted with, ſince, without admitting the various kinds, or orders, of dæmons, which the heathen philoſophers, eſpecially Platoniſts and Pythagoreans, ſpeak of, or thoſe elementary ſpirits, that *Paraceliſus*, in his extravagant book of them, calls ſilphes, nymphs, gnomes, and ſalamanders, not to admit theſe, I ſay, the ſcripture itſelf ſpeaks of angels, good and bad, calls one of theſe laſt named, the prince of the devils, and to the bleſſed ſpirits, out of the ſtate of conjunction, gives the titles of arch-angels, angels, *&c.* and both ſtiles the ſeparated ſouls of good men, *the ſpirits of juſt men made perfect*, and mentions them as like, or equal to the angels. But to take further notice of this nobleſt inviſible world, were improper in this place. The ſecond, is the viſible world, in the uſual ſenſe of the term, conſiſting of all the bodies, great and little, that are objects proportioned to our unaſſiſted ſight. And the third, which for want of a fitter name, I venture to call the dioptrical world, which

which conſiſts of all thoſe creatures, that lay concealed, in former ages, from mortal eyes, and are not now diſcovered, without dioptrical glaſſes, and this itſelf, if one pleaſe, one may, for diſtinction ſake, diſtribute into teleſcopical and microſcopical. The firſt whereof, comprehends the numerous fixed ſtars, that good teleſcopes ſhow us, in the milky way, the pleiades, the belt of orion, and divers other parts of the firmament, or expanſum, and the latter (*viz.* the microſcopical, compriſes thoſe numerous ſets of different creatures, mineral, vegetable, and animal, which, by reaſon of their wonderful minuteneſs, remain inviſible to our eyes, unleſs they be aſſiſted by good microſcopes.

APHORISM III.

THE conſideration of ſpeech, ſeems to be a thing of importance, in the diſquiſition about divine providence. For we ſee, that a man, that knows a language, as for inſtance, Greek, or Latin, whoſe words, with the various determinations, that a good part of them may require to be declined, or conjugated, amount to many thouſands, may yet be readily pronounced, and that ſwiftly, after one another, by the bare will that the ſpeaker's mind has to pronounce them, without any *conatus* or laborious endeavour of the rational appetite itſelf, (though not always, without producing, at length, ſome wearineſs in the corporeal inſtruments of theſe numerous and various motions.) And if a man be ſuppoſed to be as great a linguiſt, as good authors aſſure us that *Mithridates* was, who underſtood the differing languages of above two or three ſcores of people, that he commanded, the wonderfulneſs of ſpeech will ſeem to be encreaſed. And if the mind of man, who is ſo *imperfect* a creature, can, without pains, or wearineſs, produce ſo great a multitude of differing motions and ſounds, why may not God, who is infinitely *perfect*, be able to produce, and regulate, as many motions, as may ſuffice to produce all the phænomena of things corporeal. And if you ſhould tell me, with ſome new Carteſians, that it is not the mind itſelf, that excites and governs theſe motions, but God who does it, at the wiſh and endeavour of the mind: I ſhall anſwer, that the objection much ſtrengthens my argument, ſince there being ſome hundreds of millions of men in the world, that, excepting very few, are well endowed with the faculty of ſpeech, God muſt be acknowledged to have, both a very extended power, an aſtoniſhing degree of knowledge, and a continual watchfulneſs and care, that ſo numberleſs a multitude of ſonorifick motions, (if I may ſo call them) ſhould be continually produced, and regulated, according to the various intentions, and deſires, of all the inhabitants of this our world.

APHORISM IV.

DIVERS of the ancient heathens, philoſophers, and others, thought the ſun a living, and rational being, and beneficent to man. To which belief, it was congruous they ſhould think, *that when* he produces thoſe lovely colours, for which we admire the rainbow, and the drops of dew, and thoſe brighter ones, that ennoble ſparkling diamonds; *and when* he ſurveys them all, he can behold no other beautiful colours, than thoſe he *gives* them (by his beams) and yet does not ſo part with, but that he ſtill continues the poſſeſſor of them, as well as he is the original and ſource. The application of this is eaſily made, by the Chriſtian *virtuoſo*, who knows, that the ſcripture aſcribes to God, to have *the fountain of light*, and teaches, that he is *the former of all things*, that he looks quite thorough them, and not only gives to men *life and breath, and all things*, but ſuſtains all his creatures, and (as the original word imports) enlivens them. Our *virtuoſo*, I ſay, being convinced of all this, muſt alſo be perſuaded, that God, who ſees all things, ſees nothing that is excellent, beautiful, or amiable, among his creatures, of which he is not the giver; and yet either formally, or eminently, (as the ſchools ſpeak) continues the poſſeſſor: whence ſo ancient and venerable a theologer, as the patriarch *Abraham*, more than once, calls him, whom he ſtiles, *the high God, poſſeſſor of heaven and earth.*

APHORISM V.

THE Chriſtian virtuoſo conſiders the rational ſoul, not barely as it guides the motions of that living engine, we call the body, but as it is a kind of impriſoned angel, that bears the image of God, and is capable of knowing, both ourſelves and him; and by a conſciouſneſs of her being his production, is capable of acknowledging, loving, and obeying him, and referring to his glory all the excellencies ſhe diſcovers, both in herſelf, and in the body ſhe is united to; by which juſt reference, ſhe is, by his goodneſs, in his divine Son, made capable of becoming incomparably more knowing, than here ſhe is, and eternally happy with him.

APHORISM IV.

THE rational ſoul, being the image of God, I do not wonder, that it ſhould be inſcrutable. For to have ſo much reſemblance to that incomprehenſible being, as to deſerve the title of his image, it muſt have a nature ſo ſublime, and abſtruſe, that at the ſame time, that our contemplations diſcover its excellency, in compariſon of all corporeal creatures, they diſcover alſo its imperfection, in compariſon of the boundleſs excellencies of its prototype. This may paſs for a truth, not only upon other accounts, but upon this, that, though its nature be very limited, yet, all that belong to it, is far from being perfectly known, even to itſelf. Whereas, notwithſtanding the infiniteneſs of God, in all his attributes, he is but an adequate object to his own infinite intellect; and his ſpirit, as the ſcripture teaches

us, *ſearches, even, the deep things of God*, the innermoſt receſs of that moſt abſtruſe and (to us) ineffable being. Which reflection ought, in my opinion, to inſpire us, both with a high degree of gratitude, for the great honour we have, to be made after God's own image and likeneſs, and with a great depth of humility, when we find, that, beſides the depravedneſs of our wills and affections, the very inferiority of our nature keeps us unable, clearly to comprehend, ſo much as ourſelves, much leſs that adorable being, that, by inhabiting an *unapproachable* light, is, to our dim ſight, *covered with darkneſs*.

APHORISM VII.

As much as we uſe to wonder at many of the bodies, among which we are placed, yet, in reality [or upon a due inſpection] man himſelf is a greater wonder, than any of the viſible creatures, that he admires. And indeed, a juſt, and well grounded valuation of the dignity of the human nature, may be made a thing, very conducive to the improvement of it. For, when a man ſeriouſly conſiders, *that* God has been pleaſed to make man but *a little lower than the angels*, even in this world, and *that* if he be not wanting to himſelf, and to the divine goodneſs, God will make him *like, or equal to the angels* in the next world. What may not a nature aſpire and attain to, that is furniſhed with ſuch endowments, and ſuch hopes? And due reflections on the excellent faculties, organs, and other talents, that God has furniſhed man with, will not only excite and animate him to high and noble attempts, but greatly diſpoſe him to contemn many of thoſe little and ignoble objects, as below him, the fondneſs of which, is wont to engage men in a great part of the vices, and meanneſſes, that diſhonour God and mankind.

APHORISM VIII.

The uſes, that man may make of creatures, made directly ſubject to his dominion, are chiefly, three.

And firſt, we may enjoy divers of them by contemplation, as he may, with great pleaſure, obſerve the beauty, number, and regular motions of the cœleſtial lights, whether fixed ſtars, or planets, and with great delight perceive himſelf to be able, without moving from the earth he lives on, to meaſure the magnitudes, and diſtances, of thoſe vaſt bodies of the ſun and planets, and, in ſome regard alſo, of the fixed ſtars, compute their ſtupendious ſwiftneſſes, and, nay frame, of all theſe, theories, to give fair accounts of thoſe as wonderful phænomena, as ſeemingly contrary motions, eclipſes, &c. that quite puzzle ordinary men, and tranſport others with a juſt admiration; man being a rational creature born, and enabled to contemplate the nobleſt objects, among which, doubtleſsly, are thoſe heavenly lights, that ſhine in the cœleſtial part of the world, it may juſtly be reckoned, with great utility, to ſo intelligent a creature, that God has provided ſuch objects, to exerciſe his reaſon, and gratify his nobleſt faculties.

Secondly, man may enjoy the world above him, by applying to his uſes creatures, that are by vaſt removes out of his reach, as the ſun, by making it afford him the elevations of the pole, and the azimuths, ſundials of all ſorts, enough to make up an art called gnomonicks; burning glaſſes of differing ſorts, and, ſome of them, of wonderful efficacy; and ſo the moon affords man, the opportunity of determining and predicting, almoſt inceſſant changes of the tides, &c. and both the ſun and moon, by their eclipſes, which his reaſon and ſkill teach him, wonderfully to foreſee, and thereby enable him to find, in the moſt diſtant parts of the world, and rectify the longitude of places, the knowledge of which is of great concern, and uſe, both to promote navigation, and ſettle geography, and to rectify the doctrine of time, and correct, even, the ancient errors of chronologers.

APHORISM IX.

The ſtudy of nature, with deſign to promote piety by our attainments, is uſeful, not only for other purpoſes, but to encreaſe our knowledge, even of natural things, if not immediately, and preſently, yet in time, and in the iſſue of affairs. For, at leaſt, in the great renovation of the world, and the future ſtate of things, thoſe corporeal creatures, that will then, be knowable, notwithſtanding ſuch a change, as the univerſe will have been ſubject to, ſhall probably, be known beſt by thoſe, that have here made their beſt uſe of their former knowledge, which there will, together with their other gifts, be *congruouſly*, as well as *munificently*, rewarded. And then the attainment of a high degree of knowledge, which here, was ſo difficult, may, to the enlightened and enlarged mind, become as *eaſy*, as it will be *ſatisfactory*: and our improved underſtandings will, with joy, perceive, how much all the knowledge, that we can give ourſelves of God's works, is inferior to what their divine Author can impart to us, of them.

APHORISM X.

When, in the future ſtate, it ſhall pleaſe God to make his ſervants happy, it will, probably, be one of the moſt effectual ways of heightening the felicity, which will welcome them, at their firſt arrival in heaven, that God will be pleaſed, as well to *awaken*, as to *enlarge* their faculties. For though we here know, and feel, that we have underſtanding, will, and affections, yet in our mortal ſtate, we do not know *how great things* thoſe faculties, when improved to the height, are capable of performing, and enjoying. And when the munificent rewarder of his faithful ſervants, ſhall pleaſe to ſay, in reference to their intellects, as he did, at the beginning of things, to the benighted water, *Let there be light:*

theſe illuminated faculties will make us noble and ſurpriſing, and, perhaps, as various diſcoveries, as, in the fourth day of the creation, the angels, that were preſent, and rejoiced at the laying of the foundations of the earth, are ſaid to have beheld, with wonder, and praiſed the Divine Author for. And *as* ſome wild American, that has never uſed his hands, but about the moſt familiar and ſimple works, can have no *ideas* of the exquiſite and beautiful things, that the hands of an excellent architect, a dextrous mechaniſt, a curious painter, and a ſkilful muſician, may be taught to produce: *ſo* in our preſent ſtate of comparative ignorance, and weakneſs, we do not ſo much as imagine, what excellent attaintments, and enjoyments, our imperfect faculties may, by divine illuſtration, and improvements, be rendered capable of, in a future ſtate. And *though* the account, which the ſcripture itſelf gives us, however it repreſents this ſtate, as deſirable enough to deſerve our higheſt ambition, and utmoſt endeavours, does not give us ſuch a repreſentation of that bleſſed condition, as the enjoyment of it will; *yet*, I obſerve two things in the accounts, that are given of it, that ſeem to allow us very elevated, and very vaſt expectations; ſince, as it tells us, concerning *the children of God, that it does not now, appear what they ſhall be*; ſo (nevertheleſs) it adds, *that when* their *Saviour*, or, *that ſtate*, or, *when what we ſhall be* (for the words may be either way rendered) *ſhall appear, we ſhall be like our* Saviour, whoſe aſcended body, is juſtly called a *glorious body*, and whoſe promiſes aſſure us, that *the children of the reſurrection ſhall be like, or equal to* the angels. And ſecondly, to heighten yet more, our expectations, the ſame ſcripture teaches us, not to meaſure our future bleſſedneſs, by any thing we here enjoy, or are acquainted with, but to look for things beyond our preſent conceptions; ſince it informs us, that not only *no eye has ſeen, or ear heard*, but that *it has not entered into the heart of man, what God has reſerved for thoſe* he vouchſafes to favour.

APHORISM XI.

He that has made ſuch rich (and, in many inſtances, admirable) proviſion, for the ſuſtenance, propagation, and welfare of brute animals, and even inſects themſelves, (to divers of which he has given, not only the neceſſaries, befitting creatures of their kind, but ornaments and beauty too) may very rationally be preſumed, to be both able, and diſpoſed, to furniſh his crowned ſervants munificently, with all that may be requiſite to entertain, and improve their enlarged and enlightened faculties, with the moſt worthy and moſt ſuitable objects, and with the other advantages, becoming the glorious ſtate of thoſe happy ſaints, that are not only the nobleſt of his viſible works, but the brethren, and reſemblers of his divine, and moſt beloved Son, whom, on that ſcore he has not only dignified in their nature, but crowned with his ſupernatural rewards.

To the ſecond motive, to thank and love God, viz. what *he will do for man*, if he be pious, belongs the conſideration, 1ſt, Of greater diſcoveries of the nature and glory of God. 2dly, The rectitude, the improvement, and the enlargement of his faculties, underſtanding, will, and affections. 3dly, The great diſcoveries that will be made to man, of the nature of other creatures, and of the ways by which they themſelves act, and are by God governed. 4thly, The æthereal bodies, which the ſoul will then inhabit. 5thly, The free converſation with other juſt men, and with the good angels, and their glorious head. 6thly, An aſſurance that all this felicity ſhall laſt for ever.

PROPOSITION II.

That a man's own experience (eaſy to be ſeconded by that of *others*) may diſcover unto him, the excellency, ſatisfactorineſs, and the advantageouſneſs of thoſe graces, and virtues, that are recommended by Chriſtianity.

To clear the way, for divers paſſages of the enſuing diſcourſe, I ſhall, in this place, obſerve, that though it be a very common error, yet, it is one, that I think very prejudicial, not only to phyſicks, but to divers things, that are of a moral nature, to ſuppoſe, that no experience, or at leaſt none conſiderable, (or uſeful) can be had, but of things, that are *without* us; that is, of external things, and their operations upon one another, and upon our bodies. Whereas, indeed, divers of the moſt certain, and perhaps of the moſt important notices, we have, by experience, are afforded us, by the *internal* operations of our own faculties, and the perceptions we have, of what paſſes within ourſelves. So that, for an experimental knowledge of ſeveral things, that highly concern us, we need, neither mathematical inſtruments, nor chemical furnaces, but only a due attention to thoſe things, that are tranſacted within our own ſelves, and make impreſſions on us, whereto we can ſcarce avoid the finding of ourſelves conſcious. For, as the mind is the true ſeat of delight, and grief, happineſs, and miſery; ſo it is, as the mind is pleaſingly, or ungratefully affected, that we are all well, or ill ſatisfied with the ſtate we are in; and all outward things are conſiderable to us, but as they are capable to pleaſe, or diſſatisfy the *mind*. And the delights of this, may be oftentimes great, notwithſtanding the abſence, or perhaps the loſs, of thoſe external goods, that otherwiſe are wont, eſpecially, to pleaſe her, if, at the ſame time, there be excited in her, very pleaſing perceptions; though theſe proceed not from the uſual outward cauſes, but from any other, and particularly from the operations, and impreſſions, of her own formerly diſregarded faculties.

The happy experience of a good and religious man, will convince him, that the contentment, and other advantages, accruing from a ſerious courſe of piety and virtue, are exceeding great and valuable, and do much

ſurpaſs,

ſurpaſs, in true and intrinſick worth, the ſinful pleaſures, that a contrary courſe affords thoſe, that chooſe it.

I MENTION the *experience* of the perſon, I ſpeak of, in ſuch a way, as does already ſuppoſe him *good* and religious, for two reaſons. The *firſt*, becauſe the ſatisfaction, that ſuch perſons receive, upon the account of being ſo, can ſcarce be fully known, but by a man's own perſonal trial, which makes him feel ſuch pure and manly delights, in obeying the laws of his God, and the dictates of his reaſon, and his conſcience, that thoſe, who have not felt the like, cannot have any adequate ideas, or genuine reliſhes of them: theſe being pleaſures, that, flowing from God himſelf, and being poſſeſſed immediately by the rational ſoul, as marks of his paternal love, and recompences of the nobleſt kind of actions, may juſtly be ſuppoſed to be peculiar, as well in their degree of ſweetneſs, as in their excellency of nature.

AND *ſecondly*, becauſe, that till a man has made ſome good progreſs in a Chriſtian courſe, he is not, ſufficiently, capable of enjoying and reliſhing the contentments of it, by reaſon of the difficulties, that men uſually find, eſpecially at the beginning, to reſiſt and ſurmount thoſe vicious habitudes, unruly paſſions, and ſenſual luſts, the triumph over which, and their conſtant ſubjection to the laws of God, and reaſon, make up a great, and noble part of the true Chriſtian's pleaſures.

AND now, having declared, why, in my expreſſions, I ſuppoſed the good man, I meant to ſpeak of, to be experimentally ſuch; my next taſk muſt be, to ſhew, that the condition of ſuch a perſon, is really very deſirable, as upon other accounts, ſo, eſpecially, upon that of the *contentment* and *advantages*, deſervedly, belonging to it.

THAT the laws of Chriſtianity, if duly obeyed, are very advantageous to the obſerver, will be eaſily granted, if we conſider, that they are given us by *God*, who is the author of our nature, and, conſequently, underſtands it better, than either other directors, or we ourſelves can do; and by his divine Son, who ſo loved mankind, that he left heaven to die for men, and gave them in his death, and his life, a moſt perfect example of the obedience he requires of them. And whereas other legiſlators, being intereſted perſons, and having need of their ſubjects performances, are wont to frame their laws with more regard to their own advantages, than theirs, on whom they impoſe them: God, who is *ſelf-ſufficient*, and needs no man's ſervices, and whoſe munificence, and goodneſs, are inexhauſtible, and exuberant, gives us laws ſo admirably framed for our own good, that, it is as much our advantage, as our duty, to obey them: ſince our obedience, both highly improves us at preſent, and qualifies us, through his divine bounty, both to obtain future rewards, and to reliſh them. So that by enjoining us to ſtudy the myſteries of the goſpel, and to exerciſe ourſelves in the virtues it enjoins; he prepares us for a full fruition of the bleſſed ſtate, he deſigns us; and does, in St. *Paul*'s phraſe, make us *meet to be partakers of the inheritance of the ſaints in light*; which previous aptitude will very much endear it to us: as when a muſician, by teaching his ſon his art, makes the gifts of his lutes, and other muſical inſtruments, much more welcome and acceptable to him, than if he had given him them, without having inſtructed him in muſick. * * *

AGAINST what has been diſcourſed, of the advantages, and joys of a good and pious life, I know there may be made an objection, which ſeems to be of very great weight, becauſe it is taken from the confeſſion, of one of the greateſt preachers, and patterns of Chriſtian piety, that any age hath afforded us. For, no leſs a perſon than the apoſtle St. *Paul* himſelf acknowledges, or rather aſſerts, that *if in this life only, we have hope in Chriſt, we are of all men, the moſt miſerable.* 1 Cor. xv. 19.

BUT, to this ſpecious objection, I have three things to return, by way of anſwer.

FOR, *firſt*, I conſider, that this is not an univerſal affirmation concerning pious Chriſtians, in all ages and places, but is to be limited, by circumſtances. For at that time, indeed, the ſincere and conſtant profeſſors of the Chriſtian religion, were ſadly expoſed, not only to ſcandals and injuries, but, in many places, to open perſecution, partly from the Gentiles, and more, from the unbelieving Jews, and ſome mungrel Chriſtians, that (to ſave their own ſtakes) joined with them in oppreſſing the orthodox. But though for theſe, and the like reaſons, the ſtate of the ſincerely pious was, when St. *Paul* wrote that epiſtle, expoſed to great diſtreſſes and dangers; yet it will not follow, that what was then truly ſaid, may be juſtly extended to all times and places, without excepting thoſe, where kings and other magiſtrates being Chriſtians, and orthodox, make it their buſineſs to protect, and encourage thoſe that are ſo too, thereby endeavouring to accompliſh the propheſy of *Iſaiah*, that there ſhould come a time, when the people of God ſhould have *kings for their nurſing fathers, and queens for their nurſing mothers.* Iſa. xlix. 23.

SECONDLY, I conſider, that this text is not ſo fitly rendered, as I think it may, and ought to be. For in my apprehenſion, the words will not only *bear*, but ſeem to *require* another ſenſe, than our tranſlation gives them. For it ſeems more proper to ſay, that we have hope in Chriſt in this life, than in the next; for here, as the ſame apoſtle ſpeaks, *we live by faith, and not by ſight*, but after this mortal life is ended, *hope* will be turned into certainty and *fruition*, according to what the ſame writer, elſewhere, ſays—hope that is ſeen, is not hope; for what a man ſeeth, why doth he yet hope for? Wherefore I would rather render the Greek particle ἐν, by *for*, than by *in*. 2 Cor. v.

FOR I conſider, that the Hebrew prefix ב, that anſwers to it, does in ſeveral texts ſignify *for*, and import the impulſive cauſe, or end of the action: as when *Jacob* ſays to *Laban*,

Gen.xxix. 18. *Laban, I will ſerve thee ſeven years, for Rachel thy younger daughter*, and the ſame expreſſion is uſed, not only, in two other places, in the Ver. 20, 25. ſame chapter, but in that paſſage of the prophet *Hoſea*, in which the ſame ſtory is referred Hoſ. xii. 12. to, where it is ſaid, that *Iſrael ſerved for a wife, and for a wife he kept ſheep*; what our tranſlators have, according to the exigency of the ſenſe, juſtly rendered *for*, is in both places, in the original, the ſame particle we are now ſpeaking of, which is alſo employed, in the like ſenſe, in divers other texts of the old teſtament. And ſince (as it hath been well obſerved by ſome modern criticks) the Greek penmen of the new teſtament, being themſelves Hebrews, did very much hebraize, in many parts of their writings; it need not be thought ſtrange, if, in ſome paſſages of the new teſtament, they uſe the particle in the ſame ſenſe with the Hebrew, to which it moſt commonly anſwers, and employ it to expreſs, ſometimes, the impulſive cauſe, and, ſometimes, the final cauſe, or thing aimed at, (which itſelf is alſo a motive;) and that the propoſition will bear this ſenſe, may appear by ſeveral texts, (ſome of them cited in the margin) and, among others, by that known paſſage in St. *Matthew*, where our Saviour Matt. vi. 7. ſpeaks thus, to his diſciples, *When ye pray, uſe not vain repetitions, as the heathen do, for they think that they ſhall be heard for their much ſpeaking*. And that which more induced me to vary from common tranſlators of this text, was, that whereas it is manifeſt enough, that the penmen of the new teſtament, do, in their Greek, very much follow the dialect of the Septuagint, whoſe verſion of the old teſtament was, generally, uſed in the apoſtolick times, I remembered, that I found the Greek particle employed, by thoſe interpreters, in the very ſame ſenſe, that I would render it in: for in *Hoſea* (xii. 12.) where the prophet ſpeaks of *Jacob*'s flight into *Syria*, he ſays, according to the Hebrew particle, that I lately obſerved to have been uſed in that very ſtory, that *Iſrael* ſerved *for* a wife. And according to this rendering of St. *Paul*'s expreſſion, the ſenſe of it will be, that if for this life only, (that is, for the ſake, or on the account of the good things of this life, that we receive, or can expect) we have hope in Chriſt, we are the miſerableſt of men.

I CONSIDER, in the third and laſt place, that though, if a Chriſtian's hope did not reach beyond the grave, but were terminated in the things he is like to meet with, in this life, Chriſtianity, eſpecially under ſharp perſecutions, would be but a melancholy religion: yet, it cannot thence be inferred, that it is ſo to thoſe, whoſe hopes reach, not only beyond the grave, but as far as eternity itſelf. For, though we ſhould ſuppoſe, (in ſpite of the great reaſon we have to the contrary) that all thoſe *great and precious promiſes*, as the ſcripture calls them, which are made in the goſpel, to thoſe, that heartily believe, and obey it, ſhould prove illuſory in the event; yet, as long as a Chriſtian does not believe, or ſo much as ſuſpect, that they will ever deceive him, the hope, and expectation of no leſs than heavenly joys, and endleſs happineſs, in a future ſtate, will not only allay, but ſweeten all his hardſhips, and ſufferings, in this life. For the ſupport, and comfort, we receive from things, conſidered barely as future, flow from our hope, as it is hope, without conſidering, whether it may, or may not, deceive us: and if the objects of that hope be not to be poſſeſſed, but in the life to come, a Chriſtian ſhall not find the fruſtration of that hope, till he be dead, and conſequently may enjoy the pleaſures, that attend ſuch a hope, as long as this life laſts, and ſo cannot be thought one of the miſerableſt men, in the world. There have been examples in our age, and one in our nation, of perſons, that being heirs to crowns, did yet travel diſguiſed in foreign countries, like thoſe private men that accompanied them. But though one of theſe princes had been caſt away, or had died in his return, yet, it will ſcarce be doubted, but that, whilſt he travelled *incognito* towards the kingdom, he looked on, as his patrimony, the expectation of ſo great, and dazzling a thing, as a crown, made him, during the hardſhips of his journey, far more happy, than thoſe that accompanied him in it, without being animated by any ſuch hope. And to ſuch a purpoſe, I remember the ſcripture affords us a real inſtance, in the ſtory of *Jacob* and *Rachel*. For, though he ſerved the churliſh *Laban*, ſeven years for the lovely *Rachel*, and was in the end deceived, and put off with blear-eyed *Leah*, yet, the value he had for the beautiful object of his paſſion, and the expectation of poſſeſſing her at laſt, as the recompence of his ſervice, did ſo alleviate all his burdens, and refreſh him in all his toils, that the text ſays, the ſeven years he ſerved, for the beloved object, *ſeemed to him but a few days*. Gen.xxix. 20.

THE natural reſult of the three foregoing conſiderations, will be this, that the paſſage of St. *Paul* ought to be underſtood, in another ſenſe, than that which is ſuppoſed in the objection; and ſo, that it ought not to hinder us from believing, what thouſands have found true, viz. that ſincere Chriſtians may, even in this life, be far from being miſerable: not to add, that they may enjoy more real and ſolid contentment in this world, than thoſe, that neither ſeek, nor expect it, any where elſe. * * *

APHORISM.

As there is a far greater pleaſure given to a novice in muſick, when he is taught to play better and better upon a lute, than when he is preſented with viols, virginals, and other inſtruments, that he knows not how to make uſe of: ſo one, that has the virtue of making the beſt uſe of a ſmall fortune, may enjoy more true contentment in it, than one that is an unſkilful, and diſorderly poſſeſſor of great external riches.

PROPO-

PROPOSITION III.

THAT perſonal experience (as well as vicarious) may convince a man of the evils of differing kinds, that attend a vicious courſe of life, and even particular ſins, and of the reſiſtibleneſs of temptations to them.

THE main inconveniences of a vicious, and ſinful courſe of life are, referable; 1. *To* the mind, or ſoul, both as it is endowed with underſtanding, and will, and as it is the principle, and ought to be the moderator of the affections. 2. *To* the body, in point of health, *&c.* 3. *To* a man's fortune, or outward ſtate, and that in divers regards. 4. *To* a man's reputation, or eſteem, among men. 5. *To* his poſterity (if he have any) and 6. *To* the everlaſting ſtate, or condition, of his ſoul.

BESIDES the things, that are more commonly, and very juſtly employed, to diſſuade men from vicious courſes, and eſpecially from ſuch as waſte their conſciences, or blaſt their reputations, there are two things, that, though not wont to be much inſiſted on, have, I confeſs, ſtill appeared of great weight to me, to with-hold men from thoſe habitudes, or even ſingle actions, that are either very *criminal*, or very *ſcandalous*. For I conſider, that a *heinous* ſin is ſo provoking to the moſt holy God, who, as the ſcripture ſpeaks, *is of purer eyes than to behold iniquity*, without abhorrence, that though, upon a ſincere repentance, a man may be ſo far pardoned, as to be reſcued from eternal torments, in another life; yet to keep him under, a ſenſe, and penitently mindful of his tranſgreſſions, he may be ſo chaſtiſed in this life, as frequently to find *it a bitter thing*, to have thus provoked his moſt juſt and ſovereign maſter. And as aſtrologers tell us, that very great eclipſes do miſchief, not only, whilſt the darkneſs does manifeſtly laſt, but by a malevolent influence, that continues a great while longer: ſo we may juſtly fear, that a heinous offence, will not only, for the preſent, intercept the *light of God's countenance, (which is better than life)* but may, for a long time after, (and, perhaps, for all our days) expoſe us to inflictions, that, only his gracious deſigns in them, diſtinguiſhes from heavy puniſhments. To which reflection, I may accommodate that remark, of divers of the Jewiſh Rabbies, who were wont to ſay, that *no miſchief falls upon Iſrael, in which there is not a mixture of the golden calf*; according to that paſſage in *Exodus*, where it is ſaid, nevertheleſs, in the day when I viſit, I will viſit their ſin upon them, *h e. when I puniſh other offences, I will further puniſh this.*

Exod. xxxii. 34.

AND we may obſerve, that though, upon *David*'s ſolemn repentance, and humiliation, his life was ſpared, and he was reconciled to God; yet the death of *Uriah* was followed by that of the child, *David* was ſo concerned for, and his ſubſequent life, was little more, than a ſeries of afflictions, and thoſe ſuch, as, for the moſt part, were fit to remind him of his faults.

AND as for *very ſcandalous* ſins, *beſides* that they do ſo highly offend God, that after theſe, as we lately obſerved of crimes, even true repentance does not always, ſecure the penitent from ſmarting for them, in this life; as, when *David* was forgiven, both his *adultery* and his *murder*, he was chaſtiſed for his *ſcandals*; beſides this (I ſay) I conſider, that though, after ſuch a ſin, I ſhould be pardon edmyſelf, yet, it is not only poſſible, but probable, that ſome or other, if not many, of thoſe that my bad example, or corrupt diſcourſes, or writings, may have perverted, may not be ſo happy as I, but die without repentance, and, conſequently, without human poſſibility of ſalvation. And, ſince we have ſeveral examples of mere moral men, endowed, but with an ordinary meaſure of good nature, who having, on ſlight provocations, deſtroyed men in duels, or but caſually, or without deſign, killed ſome body in hunting, or otherwiſe, have been ſo ſenſible of a miſchief they did by miſtake, or miſchance, as to deplore it all their lives: with what trouble and regret, ought I to look back, upon a ſcandalous action, that was not only ſinful in itſelf, but naturally tended to make others ſo, and made me criminally acceſſary to the eternal ruin, perhaps, of my neareſt and moſt familiar friends, who may, for ought I know, be curſing me, in a ſtate of unſpeakable miſery, and themſelves, for having ſuffered me, to have ſo much influence on them. So that if we could think, that grief could have acceſs to heaven, (for we are taught, that there is *fulneſs of joy*, and that *all tears ſhall be wiped from their eyes)* a good man might ſurmiſe, that his happineſs would, even there, be much allayed, by the remembrance of the miſchief he drew on others. And therefore I look upon it, as one of the chief favours vouchſafed me, by the divine goodneſs, that I have been heard, when in my youth, I often made the Pſalmiſt's prayer, *to be kept from preſumptuous ſins*, which uſually prove *ſcandalous* ones too. * * *

* * * * * ANOTHER advantage, and that no ſmall one, accrues to our experimentarian, towards being virtuous, and religious, from his genius, and way of philoſophiſing. For theſe incline, and accuſtom him, to ſlight and reject popular opinions, and to judge of things by ſolid, and intrinſick arguments, not the prejudices, and authority of the moſt. He that ſearcheth into nature, with the freedom, as well as induſtry, that becomes a philoſopher, will diſcover ſo many vulgar errors, as will juſtly make him very backward to believe an opinion true, becauſe it is vulgar. And he will prefer one good argument, or clear experiment, to the unanimous ſuffrages, not only of a multitude of plebeian judges, but of men of great titles, and, perhaps, reputation too: ſince, even ſuch may greatly miſtake, either for want of right principles, or for want of attentively and impartially conſidering them. Now it will be eaſily granted by him, that duly obſerves what paſſeth in the world, that a great deal of the vice and irreligion, that is too frequently to be met

with among men, proceeds from the wrong eſtimates, that they make of things. * * *

PROPOSITION IV.

THAT the ſame kind of experience may aſſure him of the practical poſſibility, of performing the duties and functions of a Chriſtian, by the help of thoſe aſſiſtances, that God gives the faithful implorers of them, to enable them to obey, and pleaſe him.

THE chief things, that render the laws of Chriſtianity practicable, are referable to theſe heads; *The* internal advantages, that piety and virtue bring to their embracers, (to which belong the ſerenity of mind, the peace of conſcience, and the joys of a good one, *&c.*) *The* aſſiſtances of the holy Spirit, both in our actings and ſufferings for religion. *The* external or ſecular advantages of a virtuous life, ſuch as frugality, health, belovedneſs, reputation, *&c.* to which may be referred, *the* advantages that the publick receives from the practice of virtue, as alſo *the* immunity from the inconveniences that attend vice. And to all this, may be added, *the* eaſineſs that cuſtom brings to all ſuch practices, as we are ſpeaking of, (ſo that the advantages of virtue may be conſidered, either abſolutely, or reſpectively, and in the latter ſenſe, much of the following ſection may be accommodated to them.) Laſtly, to this ſection belongs *the* well grounded hope, and expectation of an eternal and ineſtimable reward.

THE benefits and advantages of a virtuous and religious life, and the miſchiefs and inconveniences that attend a contrary one, are ſo many, and ſo great, and ſome of them, ſo conſpicuous, and acknowledged, that it would be hard for conſidering men, not to prefer the former courſe of life, before the latter, if they were not deterred by an apprehenſion, *That the difficulties and hardſhips that attend a Chriſtian life, make it ſcarce, if at all, practicable.*

To ſurmount this great prejudice, (than which, perhaps, there is hardly any one, that has kept off greater numbers from turning votaries to real goodneſs) a perſon inclined to make trials of all ſuch things as may be innocently tried, and are very beneficial, if they ſucceed, has a great and peculiar diſpoſition. For the difficulties that attend a pious and virtuous life, though, I confeſs, they are not inconſiderable, yet really they are not near ſo formidable, as moſt men imagine them; and a great part of their ſtrength lies in the weakneſs, and faintneſs, of our reſolutions, and endeavours, to ſurmount them. And therefore, he that reſolvedly enters upon a virtuous courſe of life, will, by happy experience, be encouraged to proſecute it; becauſe in practiſing virtue, both moral and Chriſtian, as in learning to play upon the lute, or ſome other muſical inſtrument, exerciſe does daily, both leſſen the difficulty, and encreaſe the pleaſure. And he, that upon the motives ſuggeſted by Chriſtian religion, and enfranchiſed reaſon, ſhall reſolutely engage in a courſe of piety, will experimentally find himſelf, both animated, and ſtrengthened to proceed, by the ſeveral helps and encouragements contained, and promiſed in the holy ſcriptures, and the writings of the beſt philoſophers. Of which encouragements, and aids, the chief and the only, I ſhall touch upon, are thoſe that follow, (viz.) our *obligation* to obey God and reaſon; the *promiſes* contained in his holy word; the *inward aſſiſtances* of his holy Spirit; and the *advantages* which, in the nature of the thing, accrue from the practice of real goodneſs. * *

I KNOW it may, and I doubt not will, by many be objected, that they cannot believe the acquiſition of virtue, and piety, to be ſo delightful, as we pretend: ſince one cannot, without offering a very great, and *painful* violence to himſelf, forego the pleaſures, that inclination, and cuſtom, have endeared to him, and exchange them for the hardſhips, whereto religion expoſes its embracers. Nor is it poſſible, that a man ſhould take much *delight* in the actions of virtue, which, for the moſt part, croſs our affections, or our intereſts.

To anſwer this twofold objection, by degrees, I ſhall begin with frankly acknowledging, that the firſt ſteps, that are made by a reclaimed ſinner, are really uneaſy enough. But that proceeds not barely, from the amiable nature of the things, he forſakes; but in great part from the difficulty of leaving off an inveterate cuſtom, though, perhaps, that cuſtom itſelf, be the chief thing, that endears the thing forſaken. Of which we have a notable inſtance, in thoſe that take tobacco; who, when they firſt begin, find it a drug very unpleaſant and nauſeous, ſo that it uſually makes them very ſick, and apt to vomit: but when cuſtom hath made it familiar to them, few can leave it off, without much uneaſineſs; ſo that by-ſtanders are tempted to think them bewitched, when they ſee them ſo loth to part with ſo *ill* ſcented a weed. We muſt not therefore wonder, or be diſcouraged, if at the entrance into a virtuous courſe, we meet with ſome trouble, and uneaſineſs; ſince as theſe proceed chiefly from the difficulty, that uſually attends the changing of a long cuſtom, though for a better; ſo, when once this cuſtom is forſaken, and brought into diſuſe, and a contrary one introduced, in its place, the advantages virtue has of vice, in the very nature of the thing, will daily render it leſs troubleſom, both further to forſake vicious cuſtoms, and to follow virtuous ones. And indeed, it is one of the greateſt pieces of wiſdom, to reſolve and attempt betimes, to acquire good habitudes; ſince thoſe, which reaſon approves, as moſt eligible, cuſtom will render practicable, and conſcience delightful too. And this rule is ſignally applicable to our caſe. For, in the exerciſe of piety, and virtue, not only every new act is attended with that encreaſing facility, that flows from cuſtom, as it is cuſtom, but (through the goodneſs of God) it is alſo rewarded, and encouraged with an encreaſe of divine grace, and ſtrength; ſo that the eaſineſs is encreaſed, and, perhaps, turned into delight, by the freſh influences of the holy Spirit, and the

renewed applauſes of a good conſcience. And this is the firſt part of my intended anſwer to the lately propoſed objection.

But I ſhall further repreſent, as the ſecond, and chief part of the ſame anſwer, that, in my opinion, ſenſualiſts much miſtake, when they judge of the hardſhips and contentments of a pious man, by what themſelves would feel, if they were to abſtain from all the things he forbears, and do all the acts of virtue he performs. For the pleaſantneſs (and the like may be ſaid, *mutatis mutandis*, of the uneaſineſs) of human actions, is not an abſolute, but a relative, or reſpective thing, and depends upon the congruity, or ſuitableneſs, betwixt the object, and the faculty, or between the action itſelf, and the diſpoſition of the agent. * * *

Though that were true, (which I do not grant it to be) which the libertines pretend, when they ſay, that they do not really find any laſhes of conſcience, to diſturb the enjoyment of their forbidden pleaſures; yet it would not follow, that a virtuous man, whoſe faculties are not depraved by bad education, ill company, or vicious habitudes, may not receive a great deal of joy and contentment in the acquiſition of truth, and the practice of virtue. For there being in rightly diſpoſed minds, natural notices of truth, and error, and of moral rectitude, and pravity, accompanied with an innate propenſity to purſue the one, and avoid the other: ſuch a man cannot duly exerciſe his faculties, in order to ſuch ends, without being internally recompenſed with a delightful ſenſe of having done, what became him, as a rational creature. And ſenſualiſts have as little right to undervalue ſuch a perſon, for ſo employing himſelf, to his own juſtifiable ſatisfaction, as a man, that has a dull ear, and is ignorant of muſick, has to cenſure him that having a good ear, and a ſtrong inclination to muſick, takes the pains to learn the rules of that art, and to tune a lute, invited by the pleaſure of knowledge, and the agreeable ſenſe of melodious harmony. * * *

PROPOSITION V.

That both a man's own, and other mens experience, may oblige his aſſent to the truth of what the ſcripture teacheth of the good and bad eſtate of the pious, and the wicked.

The heads of the fifth propoſition.

1. It is deplored and reprehended, that Chriſtian virtuoſi, as well as other *believers*, ſhould not be more concerned and aſſiduous ſtudiers of the ſcriptures, than moſt of them are, and ſhould not make particular uſe and application of the advantageous truths, it may afford them. 2. The ſcripture, well conſidered and methodiſed, contains a far more copious, as well as better collection, or ſyſtem of truths, uſeful to the purpoſes of good and ſtudious men, than even they, are wont to be aware of. 3. That the author of the ſcripture, being alſo that of mankind, and the great diſcerner of hearts, and governor, as well as lover of men, has given us, in the ſacred records, the trueſt judgments, inſtances, and examples, of what is really, and has actually been found good, or bad, for man, that can be met with any where. And it is a ſtrange, as well as ſad perverſeneſs, that we, that believe divers things, that are above, and others, that ſeem contrary to reaſon, and prudence, upon the authority of that book, ſhould not, upon the ſame authority, aſſent to aſſertions, about the vanity of the world, and other moral things, which our reaſon cloſes with, and all the experience we have, bears witneſs to, and confirms.

The careleſſneſs, or ignorance of men, keeps moſt of them from diſcovering, as well in the *written*, as in the *created* book of God, many excellent footſteps, and, as it were, ſignatures of the divine Author's wiſdom and goodneſs, that a more ſkilful and attentive ſurvey will enable us to diſcover. And thus a butcher kills and divides into pieces, ſheep and oxen, perhaps a thouſand times, and takes the calf out of the cow's belly, without ever diſcovering any thing of that wonderful contrivance, that a good anatomiſt will, by ſkilfully diſſecting the ſame animals, take notice of, and much more, without perceiving in the womb, and in the humours and veſſels wherewith it ſupplies the *fœtus*, that admirable œconomy, whereby the *ſpecies* is propagated. And thus houſe-wives take care of the hatching of the eggs, without obſerving any thing conſiderable of the excellent method, that nature follows in the formation of chickens, which yet, has given no leſs wonder, than exerciſe, to thoſe great enquirers, *Ariſtotle*, *Fabricius ab aqua pendente*, and our famous *Harvey*. And thus moſt readers, and even many learned men, peruſe the ſcripture ſo ſlightly, and deſultorily, that ſo tranſient and ſuperficial a view makes them overlook in it, a multitude of excellent and inſtructive things, and leaves them great ſtrangers to thoſe myſterious harmonies, and ſymmetries, that, lying deep, are leſs obvious. Whereas a diligent and devout peruſer, furniſhed with the original languages, and other uſeful parts of learning, by attentively and aſſiduouſly reading thoſe excellent writings, and carefully comparing place with place, phraſe with phraſe, and, in ſhort, adding one help of interpretation to another, may diſcover excellent and myſterious truths, that are wholly miſſed by vulgar readers; and are, ſome of them, ſo ſublime, ſo important, and ſo delightful, that his admiration of them will leſſen that which many conceive, at St. *Peter*'s ſaying, of the œconomy and myſteries of the goſpel, that *the angels* themſelves *deſire to pry into them.*

And, on this occaſion, give me leave to offer to you a notion, which, perhaps, you have not met with, and which yet may, I hope, be uſeful to my preſent purpoſe. And it is this, that I obſerve the generality of Chriſtians (I wiſh I could not add of divines too) are wont to look upon the ſcripture as a repoſitory

poſitory of articles of faith, and laws of life, without ſufficiently conſidering it as a book, that contains ſuch things, as being orderly laid together, would make up a body of Chriſtian morals, far more uſeful to a believer, than the Ariſtotelian, or other heathen ethicks. For the holy ſcripture does not only lay down excellent rules, as well for the regulation of the courſe of our lives in general, as for the practice of particular virtues, and that in great variety of circumſtances; but it alſo contains (which is what I would chiefly obſerve) ſuch rational arguments, and ſtrong motives to piety, and virtue, and affords ſuch great *comforts*, and *ſupports*, in the hardſhips, whereto they may expoſe us, together with ſuch powerful *helps* to perform what it directs, and obtain what it promiſes, as, though they are peculiar to the Chriſtian religion, are more excellent and engaging, than all that philoſophy hath been able to afford us. And though I deny not, that ſome of the heathen moraliſts have, here and there, glanced at ſome of the ſame things that are employed, to the like purpoſes, in the ſcripture, yet, beſides that, it is but of ſome of thoſe things, that this can be truly ſaid; beſides this, I ſay, thoſe very particulars are, by the heathen writers, rather touched upon, than inſiſted on, and ſeem to have been lighted on, almoſt by chance, being mentioned, among other things, without having any peculiar ſtreſs laid upon them, by their authors, who ſeem not to have known the weight, and worth of them; whereas they are, in ſcripture, inſiſted on and improved, being inculcated with that earneſtneſs, that obliges the Chriſtian reader to take notice of them, as things, whoſe importance makes them deſerve a particular attention, and regard: the Chriſtian religion is juſtly ſtiled by St. *Paul*, *The doctrine, which is according to godlineſs.* For it is indeed, a doctrine mainly deſigned, and excellently contrived, for the promoting of true piety, and virtue, in the world. In order to which end, it affords us, not only excellent precepts, ſhining examples, pathetical exhortations, ſweet conſolations, great and precious promiſes, and powerful (though ſecret) aſſiſtances: but the very myſteries of Chriſtianity, though their chief office ſeem to be, to enlighten and inform the underſtanding, yet have, moſt of them, a direct influence upon the will, and great tendency to make men good, reſembling the pillars of cloud, and of fire, in the wilderneſs, that were not only to be gazed on, as rare and wonderful things, but both were intended, and did happily ſerve, to lead the Iſraelites, that followed that cœleſtial guide, to the bleſſed land of *Canaan*, the type of heaven.

1 Tim. vi. 3.

* * * And here I ſhall add, that, in my opinion, it ought much to recommend many of the things, that revelation diſcovers to us, that they are congruous, and, if I may ſo ſpeak, ſymmetrical, to what reaſon itſelf teaches us; and this ſupernatural light, does not only confirm, but advance and compleat, the truths diſcoverable by the light of nature. For God has ſo excellently ordered the diſcoveries he makes of theological truths, by mere reaſon, and by the holy ſcriptures, that what revelation ſuperadds to reaſon, does, both very well agree with it, and ſupply what was wanting to it, that from them both, might reſult as compleat a body of theological verities, as is either neceſſary, or fit for us, to have, in our mortal ſtate. *That* mankind had a beginning, though denied by *Ariſtotle*, and his followers, was affirmed by, the greater part of the heathen philoſophers, which yet, ſome of them referred, either to chance, with the Epicureans, or to ſome other way, liable to many phyſical objections, and very derogatory to the dignity of mankind. But, when the ſcripture teaches, *that* the whole race of men proceeded from one man and one woman; *that* this firſt woman herſelf, was taken from the ſide of the firſt man; *that* theſe were not made, like the reſt of the creatures, by a ſimple *fiat*, but by a peculiar and more immediate operation of God, and, as it were, a conſultation; *that* the firſt pair was not created, till after the reſt of the world was finiſhed, and fitted to receive them; *that* their ſtrict union in marriage, was not the effect of appetite, but made by the inſtitution of God himſelf; *that* he, by an expreſs commiſſion, made them lords of the terraqueous globe, and all the living creatures, it is peopled with, and *that* they knew neither ſickneſs, war, ſhame, nor toil, till they had offended their Maker, and Benefactor, by tranſgreſſing that ſingle, and eaſy law he had preſcribed them, and endowed them with a free will to keep; when, I ſay, theſe, and other particulars, are made known to us by divine revelation, reaſon well perceives, that they not only very well agree with, what men believed upon the ſcore of reaſon, viz. *that* man had a beginning; *that* he is of a nobler nature than other animals; *that* God is pleaſed to concern himſelf for him, and exerciſe peculiar acts of providence about him; and *that* his ſufferings proceed from his own faults; but the ſame revelation, that confirms theſe perſuaſions, does, by adding thoſe other circumſtances, I have been mentioning, afford reaſon materials, wherewithal to make up theſe perſuaſions, into an *account of the origin of mankind*, that agrees far better with the nature of things, the providence, juſtice, and goodneſs of God, and the dignity, and yet obligations and dependency of mankind, than any of the hypotheſes of the heathen philoſophers, and prieſts. The time, at which, we may collect from the ſacred ſtory, the world was made, if it had been known to the Ethnic hiſtorians, and philoſophers, might eaſily have prevented divers of their erroneous, and extravagant conceits; and the hiſtory of *Noah*'s flood, ſeems to afford a better account, not only of ſundry, hiſtorical, and political, but of divers natural phænomena, than any, or all, of the heathen writers have left us. And as the account, given in the ſcripture, of the creation of man by God, ſo, that, which it delivers of his redemption from his lapſed ſtate, by the Son of God, exhibits another gueſs contrivance, than

men are uſually, aware of, or, than can be here propoſed, in few words: the ſalvation of man being indeed undertaken, and managed, in a way highly rational, and upon terms, agreeable to the juſtice, honour, and goodneſs of God, and to man's nature, condition, duty, and aims, (as, on ſome other occaſion, may be declared.) At preſent, what I mainly drive at, may, methinks, be ſomewhat illuſtrated, by comparing the object of theology, to a book of excellent notions and ſecrets, but written in cyphers; and the knowledge of divine things, conferred by bare philoſophy, to a very imperfect key; conſiſting of not half the letters of the alphabet: for though, by the help of this, a man may make a ſhift to underſtand, here and there, many whole words, that conſiſt of ſuch letters, as his key anſwers to, and may perchance, on the ſame account, underſtand ſome few ſhort and ſcattered ſentences, and other periods; yet the whole ſcope, and contrivance of the book, and many of the principal things, contained in it, he muſt be ignorant of: but revelation is like the remaining part of the key, which compleats the other; and which, when he is once poſſeſſed of, he will not only learn, many new truths, and underſtand ſatisfactorily, many paſſages, which he but doubtingly, gueſſed at before; but, which is the main thing in our compariſon, he will clearly perceive, that what he has laſt diſcovered, both perfectly agrees with what he had learned before, and compleats what it wanted, to make up a ſymmetrical piece, worthy of the author. * * *

* * * In the ſcripture are contained, both obligations, and other motives, (as rules, examples, and encouragements) to piety, and virtue, and diſſuaſives from the contrary, peculiar to the Chriſtian religion. St. *Paul* exhorts the *Corinthians*, to *glorify God, both in their bodies, and in their ſpirits*; (which two conſtitute the whole man) upon theſe grounds, *that they were not their own* proprietors, but *were bought with a price*; ſo that their *bodies, and their ſpirits, were God's*, and therefore ought to be employed, in things that tended to his glory. Another obligation, and motive to piety, is the ſenſe, that Chriſtians ought to have, of the great honour of being the adopted ſons of God, *ſee* (ſays St. *John*) *how great a love* (i. e. effect of love) *the Father hath vouchſafed us, that we ſhould be called*, (that is, by an Hebraiſm, ſhould be) *the children of God*. And accordingly, we are exhorted to *walk as dear children*, and behave ourſelves *as the ſons of God*, and *born of God our Father and Saviour*; in all things aiming, not only *to obey*, but to *pleaſe* God; and by *our ſhining works*, to engage thoſe that behold them, *to glorify our Father, which is in heaven.*

* * * * Notwithstanding our greedineſs of the knowledge of natural things, and our preference of it, to that of divine things, we are not ſure, but that after the great day of judgment, the preſent viſible world, or our own notions, memories, and affections, or both theſe, will be ſo changed, that our paſt knowledge of phyſical things, may be either forgotten by us, or inſipid to us: or elſe, that, if we ſhall retain any memory of our paſt ſtudies, and labours, we ſhall find more delight in them, as they were exerciſes of a laudable induſtry, than as they helped us to acquire, the knowledge of tranſitory things.

The preſent ſtate of things will not laſt always; but that future ſtate, that muſt ſucceed it, will be eternal. And therefore, prudence directs us to regard chiefly, as well in our ſtudies, as in our actions, that ſtate that will moſt concern our everlaſting welfare. The *Chriſtian virtuoſo* is taught by the holy ſcripture, not only that *the faſhion of this world paſſes away*, whilſt we live in it, but that afterwards the world itſelf, as to its preſent conſtitution, will be deſtroyed, by that laſt fire, that will *diſſolve the main parts*, and quite *ſhatter the frame of it*. And who knows, but that in that *new heaven, and new earth*, (that is, by an uſual Hebraiſm, that new world) that God will ſubſtitute for it, the primordial frames of things, and the laws of motion, and conſequently, the nature of things corporeal, may be very differing from thoſe that obtain in the preſent worlds. And if this prove to be the caſe, our formerly acquired knowledge of natural things, may either grow uſeleſs to us, or miſlead us. But the knowledge of divine, and other immaterial objects, that will retain their nature, (which cannot periſh with the univerſal deflagration) will probably be, not only retained, but highly improved, in the glorious future ſtate. For *as* in the new *Jeruſalem*, there will be neither need of the ſun, nor yet be any night, becauſe a divine ſplendor will afford an abundant, and a perpetual light; *ſo* in the underſtandings of its bleſſed inhabitants, divine irradiations will diſpel all ignorance, that may cloud our happineſs, whether we do, or do not, enjoy the ordinary means of being enlightened; and we ſhall be ἰσάγγελοι, like, or equal to, thoſe clear ſighted ſpirits, the angels: ſo that there ſeems, almoſt, ſuch a difference between the preſent, and future knowledge of a true Chriſtian philoſopher, that the former may be compared to the light of a glow-worm, which is but very faint, and of ſmall extent, and will periſh with the ſubject of it, and is viſible but in the night; whereas the knowledge he hath of divine things, ſuch as God, and his truths, may be reſembled to the *aurora*, which, being though but an imperfect, yet a cœleſtial light, does not ſuffer by the riſing of the ſun, but *encreaſes more and more, unto the perfect day.*

* * * * To increaſe our knowlege, and thereby our felicity in the future ſtate, as God *can*, ſo, it is probable, he *will*, excite in the mind new *ideas*, and notions, which it was a ſtranger to before; and theſe will furniſh freſh occaſions of true and delightful ſpeculations. Such *ideas*, we may preſume to have been excited in the angels, at the cloſe of the ſixth day's creation, when after all the numerous, and various qualities they had obſerved, in beings merely corporeal, or, at leaſt, not rational, they perceived in *Adam*, a wonderful,

and, in probability, a ſurpriſing union of two ſuch diſtant natures, as an immaterial ſoul, and a human body. * * *

To thoſe Chriſtian virtuoſi, that are afraid to quit this world, chiefly, becauſe they fear to loſe the delightful philoſophical knowledge, they have of it; it may be repreſented, firſt, that it is likely, that as all our faculties will, in the future bleſſed ſtate, be enlarged and heightened; ſo will our knowledge alſo be, of all things that will continue worth it, and can contribute to our happineſs in that new ſtate. 2dly, And that God can make a rational creature happy, though it ſhould have no remembrance, or knowledge, of the world, or any corporeal creature, as the angels were happy before the world was created, and conſequently, without any knowledge of it, or any corporeal creature contained in it. * * * *

THOUGH the precepts of the Chriſtian religion, be each of them, ſingle and apart, excellent and uſeful, yet they are much more ſo, when they are conſidered as in a ſtate of union, and are conformed to in their entire ſyſtem; which brings into my mind what we read in *Geneſis*, that when God looked upon the particular work of every ſingle day, it is ſaid, *he ſaw that it was good*; but when he ſurveyed the whole aggregate of his creatures, as in one body, or ſyſtem, wherein, by their connexions, and ſubordinations, the parts mutually aſſiſt each other, and conſpire to promote the ſame general ends; it is emphatically ſaid, that *he ſaw they were very good.* Gen. i. 31. And though the precepts of the goſpel, as imperfectly as men have ſubmitted to, and embraced them, have done a great deal of good, and hindered a great deal of miſchief, in the world; yet they would incomparably more promote the welfare of mankind, if moſt men did not either altogether reject them, or pick and chooſe which of them they will adhere to, or elſe did conform but very imperfectly, to thoſe to which they profeſs ſubmiſſion: but did ſincerely, and reſolutely, and impartially, endeavour to conform to the whole practical doctrine of the goſpel. And indeed, if ſo excellent a religion were generally entertained with that entire belief, and hearty obedience, that it deſerves, it would make ſo great change in the ſtate of mankind for the better, that men may juſtly hope for little leſs, if not more happy and flouriſhing times, than thoſe that have been celebrated under the name of the golden age. For I conſider here, that there are four grand fountains of the miſchiefs that afflict mankind, namely, *the* evils that men are naturally ſubject to as mortal creatures, from external agents, ſuch as inevitable ſickneſſes, famines, floods, *&c.* *the* evils that particular men bring upon themſelves by their own inevitable faults, ſuch as ſurfeits, venereal diſeaſes, procured poverty, and other effects of intemperance, prodigality, *&c.* *the* evils that God inflicts on men for the puniſhment of their ſins, or to repair the imperfections of their virtues, and graces; and laſtly, *the* miſchiefs men do to one another. I do not to theſe add as a fifth, the enmity of the devil, becauſe he offending us as a moral agent, that hurts us, but by tempting and aſſiſting us to hurt ourſelves, or one another; the harms we receive from his enmity, may be conveniently enough referred to the ſecond and fourth of the noxious ſprings we have freſhly enumerated. Now as to the three latter, if the dictates of the Chriſtian religion did univerſally and unreſervedly ſway mens minds and actions, men would be almoſt entirely preſerved or freed from them. For where the precepts of the goſpel, which teach men to live ſoberly, and prudently (for the word St. *Paul* employs ſignifies both) are conſcientiouſly put in practice, they would avoid all thoſe diſeaſes, that multitudes draw upon themſelves, and which as well ſhorten, as embitter, mens lives, by drunkenneſs, incontinence, quarrelſomneſs, *&c.* and would not only eſcape many bodily diſeaſes, but alſo thoſe diſtempers of the mind, that are oftentimes far more afflictive than they. For a true Chriſtian will neither burn with rage, nor fret with impatience, nor ſwell with pride, nor pine with envy, nor diſquiet himſelf with ambition, nor pinch himſelf for avarice, *&c.*

* * * I HAVE often wondered to ſee men ſo perverſly partial, in the aſſent they give to truths, propoſed by the ſame authority. For it ſeems ſtrange to me, that Chriſtians ſhould believe thoſe paſſages of ſcripture, which tell them, that their dead bodies, though made the food of worms, or fuel of flames, ſhall have their diſperſed particles, at the laſt, reunited, (of which nature, or experience, affords us no examples, and againſt which philoſophy, not to ſay reaſon, frames very ſpecious and conſiderable objections;) and yet, at the ſame time, ſhould refuſe to believe what the ſcripture teaches, of the vanity of the world, the tranſitorineſs of this life, the hurtfulneſs of ſin and vice, the advantages of a virtuous life, and the joys of a good conſcience; though all theſe doctrines are agreeable to the dictates of unprejudiced reaſon, and, as far as we can obſerve, or try, are verified alſo, by experience.

APHORISM I.

THERE are ſome profeſſors of Chriſtianity, that talk and live, as if they would introduce a theological magick, (if I may ſo call it) which, by the help of certain words, habits, geſtures, and other ceremonies, may enable them, without ſound faith, and good life, to do ſtrange feats in Chriſtianity, as ſuperſtitious magicians pretend by charms, ſpells, *&c.*

APHORISM II.

THERE are many vices that are mean, as well as ſinful, and do as well depreſs, as deprave human nature; no leſs degrading it of its dignity, than they deprive it of its innocency.

APHO-

APHORISM III.

THOUGH a fit of ſenſual delight may, for the preſent, make very vivid impreſſions on our eyes, and even dazzle them, yet being no leſs evanid, than affecting, it can no more produce a durable joy and tranquillity of mind, or compenſate for the want of it, than flaſhes of lightning, though never ſo many, can turn the night into day, or make amends for the abſence of the ſun.

APHORISM IV.

THERE is a great difference betwixt pleaſure and joy, the one being a ſenſual, and the other a rational delight. And though vicious men may oftentimes have a greater ſhare, than pious men, of the former, yet virtuous men uſually have a far greater ſhare of the latter, which is more noble, more durable, and leſs allayed by preſent cenſures of reaſon, or remorſes of conſcience, or fear of after reckonings.

APHORISM V.

THE pleaſures, that religion depreciates, do but affect our mortal part, and are more mortal than it; uſually dying before the body, always dying with it, and ſometimes alſo, killing it.

APHORISM VI.

WHATEVER advantages of fortune a man may have, and whatever poſſeſſions he may be admired, or envied for, yet if he be ſwayed by irrational notions of things, and by impetuous and irregular appetites, whilſt that depraved conſtitution, and diſtemper of mind laſts, he is as uncapable of being made happy by the affluence of outward goods, as *Nebuchadnezzar* was, during his frantick condition, to enjoy and reliſh his magnificent palace, or his univerſal empire.

APHORISM VII.

GOD, oftentimes, by an affliction, deprives us of a preſent of his bounty, but by an effect of his love.

APHORISM VIII.

THOSE, who are content to part with their hopes of, or at leaſt forfeit their right to future goods, upon the pretence of preferring certainties, thoſe of the preſent life, before contingencies, are indeed far from having a certainty upon earth, of what they forego heaven for.

APHORISM IX.

THE ſerious meditation of *death* will teach men to deſpiſe the world, which can be enjoyed but during a tranſitory life, and the attentive contemplation of eternity will lead them to abhor thoſe ſinful practices, that tend to make it a miſerable one for them.

PROPOSITION VI.

THAT heedful obſervation may ſatisfy a man of the vanity of the world, and the tranſitorineſs of external, and, eſpecially, ſinful enjoyments; and of the emptineſs of thoſe things, for which men refuſe and forſake the ways of piety, and virtue.

The heads of the ſixth propoſition.

1. VICARIOUS experience, viz. that which is afforded us by obſervation, of what paſſes in the world, and happens to other men, may be a ſufficient proof of what is intended to be ſhown. And according to this, in divers caſes, many men are more like to paſs right judgments, becauſe the caſe is not their own. 2. Vicarious experience may be either hiſtorical, ſuch as may be gathered from the records, or hiſtories, of other times, and countries; or perſonal, ſuch as is afforded by the things, that have come within our own obſervation: the former of theſe, ſingly, may yield a very conſiderable teſtimony, but will become, much the more full and weighty, if a virtuoſo add to it, his own perſonal experience of the things, that himſelf hath obſerved; which experience, his heedfulneſs, and penetration, will render much more ample, than that of another man, of the ſame years. And if he hath lived any conſiderable time, he muſt have obſerved many inſtances of the contentment, good name, healthfulneſs, comforts, ſupports, deliverances, and other bleſſings, accruing to good and worthy men,

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by the divine juſtice, and partly ſpringing from the nature of the things, about which they are, or have been, faulty. And theſe obſervations will be much encreaſed, by diſcerning the intrigues of ſtate, and of particular, eſpecially great families. 3. But the grand force of vicarious experience lies in the teſtimony of good and bad men themſelves, when they freely deliver their minds, eſpecially when they are like, or going to die; for then maſks are uſually laid aſide, or pulled off, and men make both more ſincere confeſſions, and declarations, of their judgment, and alſo more right and impartial eſtimates of things. And then the comforts of pious men, and often the applauſes, their own conſciences give them, that have been eminently ſo, do make their condition to be incomparably more eligible, than that of the moſt proſperous ſinners, who, on their death-beds, by their grief, and oftentimes amazement, if not horror, and deſpair, do not more ſadly, than loudly, condemn, and bear teſtimony againſt the, as wretched, as criminal courſe of life they embraced.

To theſe ſix propoſitions is added a kind of ſhort and ſummary review of the ſecond and laſt part of the Chriſtian virtuoſo, with a pero-

a peroration of the whole epiſtle, to the perſon it is addreſſed to. *Hæc omnia deſunt.*

GENERAL APHORISMS.

1. A VIRTUOSO has four advantages, *&c.* one, that he is not ſwayed by vulgar opinions, and eſtimates. 2dly, That he can value pleaſures, and employments, that are of a ſpiritual nature, and do not affect either the ſenſes, or imagination; and therefore, 3dly, That he can always find himſelf delightful and uſeful employments, and ſo eſcape the dangers that idleneſs expoſes to. 4thly, That he knows the dignity, and reports of a ſoul.

2. IT ought much to elevate the aims, and raiſe the courage of a *virtuoſo*, to make ſome great attempts, and aſpire to high attainments, that the ſcripture itſelf teaches, that God made man, *but a little lower than the angel.*

APHORISM II.

WE ought heedfully to obſerve, and if we do ſo, we cannot but admire the ſignatures, *ſpecimens*, or ſtamps, of the divine wiſdom, power, and beneficence, that are, as it were, interwoven with the nature of the creatures; and indeed, in ſeveral of them, make, in ſome ſenſe, a part of it, as light, and colour, do in the rainbow, and tranſparency, and redneſs, in a ruby, *&c.*

APHORISM III.

EVEN in artificial, or factitious things, the artifice of nature, or, rather, of its author, may often far ſurpaſs the artifice of man: the texture of what man takes for the matter he is to work on, and which he looks upon, only as a material, to be faſhioned by him, as he ſhall pleaſe, being oftentimes more curious and admirable, than the contrivance it receives from art, which, frequently, does little more, than put together divers pieces of nature's workmanſhip. Thus the contexture of the hide of an ox, which, when dreſſed, we call leather, is a far more elaborate, and curious thing, than the outward form that is ſuperadded to it, to make it a ſhoe, or a boot. And a ball of ivory, or of *lignum vitæ*, is of a much leſs curious frame, as it is a globe, than as it conſiſts of an elephant's tooth, or the wood of a ſolid tree.

APHORISM IV.

THERE are ſome truths of theology, that, to become very uſeful to us, muſt be made very familiar; among which, and eſpecially, is a right notion of the Deity, which it is not enough, once in one's life, or now and then, at very diſtant times, to frame, and to aſſent to; as, anciently, it was not ſufficient for a pilot to know, and confeſs, that the pole-ſtar is a cœleſtial light, fixed, elevated, and worthy to be peculiarly regarded, but he muſt take it for the guide of his navigation, and have, ever and anon, his eye upon it to ſteer his ſhip by, and keep it from deviating from the right courſe. And, indeed, there are ſome truths, that are ſo worthy to be remembered, and ſo eaſy to be forgotten by us, that they can ſcarce be too often inculcated, and eſtabliſhed, by too many *mediums* of probation.

APHORISM V.

IT ought not to be looked upon as a diſparagement, but an advantage, to the cauſe of the aſſertors of a Deity, that it draws arguments from the teſtimony of conſcience, and a ſenſation, or perception, of what paſſes in the mind itſelf. For it is true, indeed, that the grounds of theſe arguments have no novelty to endear them, but then it ſerves more to recommend them, than novelty could do, that they were always congruous to the mind, (or radicated in it) and are, as it were, twins to human nature, being either of the number of congenite notions, or impreſſions, or elſe very near of kin to them; ſince, as the underſtanding is naturally furniſhed with ſome theoretical ideas, and notices, ſo the will is furniſhed with ſome practical ones, and, perhaps, the mind, with ſome, that naturally reſult from both.

APHORISM VI.

THE Chriſtian religion does not only ſerve its faithful diſciples, as the pole-ſtar does pilots, to *direct* them in the courſe of their navigation, but furniſhes them with winds too, to *ſet their ſhips a moving*, affording them, from above, ſtrength to ſail in that courſe, that it does from heaven, direct them to ſteer.

APHORISM VII.

As in a lute, a ſtring will be more affected by the ſoft ſound of another, that is uniſon to it, though, perhaps, it be but a ſmall one, than by the louder noiſe of all the other ſtrings, though many of them be much bigger: ſo a mind, that is uniſon, (if I may ſo ſpeak to truth,) that is diſpoſed to receive and cloſe with it, will be more wrought upon by one ſingle proof, that is, as it were, congruous, or conſonant, to it, than by many differing, and ſeemingly, more forcible arguments, that have not, to it, the like relation.

APHORISM VIII.

WHEN *Adam* was firſt brought into Paradiſe, it is like, that *though* he ſaw cauſe to admire ſeveral of the beautiful and flouriſhing trees, and other plants, that there ſurprized his ſight; *yet* he did not perceive the moſt admirable part of the artifice, expreſſed in their frame; namely, that each of them contained a latent prolifick principle, or ſeed, and ſome plants, as it is probable, a multitude of actual compleat ſeeds, each of which was fitted, notwithſtanding the ſmallneſs of its bulk, to produce a tree reſembling the

mother plant, and capable of ſucceſſively propagating itſelf, to the world's end.

APHORISM IX.

THE *cicatricula* of an egg, or the germen in the ſeed of a plant, being, in reality, a model of the animal, or plant, to be produced from it; the wonderful minuteneſs of a machine, at once ſo very little, and ſo curious, does abundantly recommend the matchleſs ſkill of the divine mechaniſt. But it does no leſs recommend his providence too, which *both* foreſaw, that the concourſe of ſo many external bodies, and adjuvant cauſes, was neceſſary to plump up, compleat, and diſplay, the parts that lay admirably folded, and packed up, in theſe little *ſeeds*, and took care, that, ordinarily, they ſhould be provided of all that aſſiſtance, which was neceſſary for them to have, from the favourable concourſe of external agents, and helpful cauſes.

APHORISM X.

MANY of the works of GOD, are as *magnificent*, as *exquiſite*; and in very many of them, he is as beneficent, as admirable.

APHORISM XI.

THE jollity, for which men are apt to envy the condition of divers notoriouſly vicious perſons, is oftentimes but put on, or affected, by men, that ſeek to delude their diſquieted conſciences, by outward diverſions. And ſuch men are as little to be envied by a good man, notwithſtanding their flaſhy mirth, as one in a violent fit of the mother, is, for the loudneſs of her laughter, which is as ſure a ſign, and oftentimes more, than as bad an effect of her diſeaſe, as profuſe weeping is.

APHORISM XII.

IT is ſcarce a more common, than prejudicial error, and the fruitful parent of many of the irregularities, and miſcarriages, of human life, that men are not aware, that happineſs conſiſts not in the poſſeſſion of external goods, but in a right *conſtitution*, and well grounded *ſatisfaction*, of the mind. And they that look upon felicity, as a thing without them, and fancy, that riches, honours, *&c.* have the ſame power to make a man *happy*, as diamonds, pearls, and other jewels, have, to make him *rich*, and ſo confound ſome uncertain, and but partial, helps to felicity, with felicity itſelf, do as unſkilfully miſtake, as the ſick man would, that ſhould think, that he muſt needs enjoy health, if he could be maſter of an apothecary's ſhop.

APHORISM XIII.

THOSE internal applauſes of virtue, beyond which the moſt heroical heathens did not aſpire, make but a pledge, and earneſt, of the pious Chriſtian's happineſs: the teſtimony of conſcience, not being, by far, ſo great a bleſſing on the ſcore, that conſcience is a domeſtic judge, as on this, that it is God's vicegerent in the ſoul, and promiſes man a much higher recompence from God, than virtue is able to give him, or man to give himſelf.

APHORISM XIV.

REMEMBER, what even men, not counted religious, will do, to quiet, and appeaſe, not gratify their conſciences; and conſider thereupon, what a good man may do, not to procure the ſilence of his conſcience, but to merit its applauſe.

APHORISM XV.

WE are to eſteem our condition, not in compariſon of what it was before our laſt affliction, but upon the whole matter: and after collation made, of what we enjoy, and ſuffer, with what moſt other men, and, among them, many better than we, endure and want.

APHORISM XVI.

To them that alledge, that ſelf-love is natural, and therefore not an imprudent principle of human actions, one may juſtly repreſent, that this aſſertion juſtifies only thoſe, that *wiſely*, but not thoſe that inordinately love themſelves; and ſuch a ſelf-love, is not only allowed, but promoted, as well as directed by Chriſtianity.

APHORISM XVII.

THE experiences, that verify that part of the ſcripture, that we do feel, or know, may well give us a great confirmation of the truth of the reſt.

APHORISM XVIII.

WE have been, from our infancy, ſo much accuſtomed to ſee nothing but bodies, and to receive all our informations from our ſenſes, that moſt men do not only make bodies, and corporeal natures, the only objects of their imaginations, and diſcourſes, but the models of their ideas, and higheſt notions, and the meaſures by which they eſtimate and judge of all other things, though, perhaps, of natures quite differing from thoſe that belong to bodies.

APHORISM XIX.

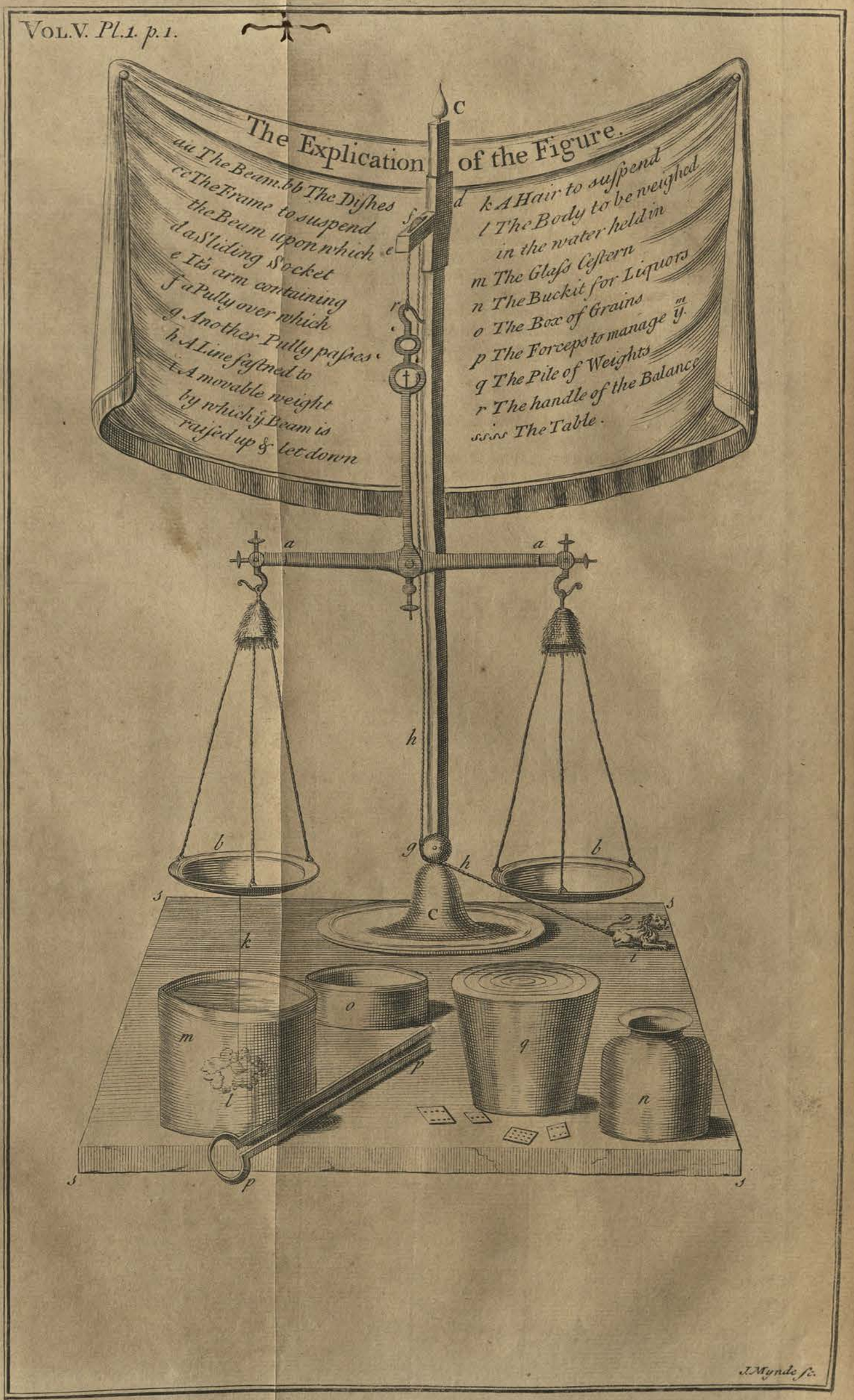
I THINK it becomes Chriſtian philoſophiſers, rather *to* try, whether they can inveſtigate the final cauſes of things, than, without trial, to take it for granted, that they are undiſcoverable; and *to* diſpenſe with themſelves for the neglect of enquiring, upon a ſuppoſition, that it muſt be fruitleſs; which courſe, a cenſorious man might ſay, was deviſed to exempt ignorance from diſparagement, and father an evitable, and therefore blameable, negligence, upon the preſumedly inevitable weakneſs of human nature.

APHORISM XX.

How negligent men are in obſerving things, and how much, upon that account, there probably remains, to be *diſcovered*, in probability, to be alſo uſefully *employed* in the works of nature, may be gueſſed at, by ſuch inſtances as theſe; *that* the loadſtone was, for many ages, admired for its attractive virtue, and yet men were not, till three or four ages ſince, aware of its directive faculty, whereby it diſpoſes both itſelf, and the needles it has touched, to regard, with their extremities, the northern and ſouthern poles: *the* ſtar-like figure of many flakes of ſnow, eſpecially thoſe that fall at the beginning of winter, or freezing times: *the* elliptical figure of the ſetting and riſing ſun: *the* great incaleſcence of quick lime with hot water, *&c.*

APHORISM XXI.

THE book of nature, is a fine and large piece of tapeſtry rolled up, which we are not able to ſee all at once, but muſt be content to wait for the diſcovery of its beauty, and ſymmetry, little by little, as it gradually comes to be more and more unfolded, or diſplayed.


The Explication of the Figure.
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cc The Frame to suspend
the Beam upon which
d a Sliding Socket
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g Another Pully passes
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i A movable weight
by which ye Beam is
raised up & let down
k A Hair to suspend
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in the water held in
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A

COMPLETE INDEX

TO THE

WORKS

OF THE HONOURABLE

ROBERT BOYLE,

IN FIVE VOLUMES.

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